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# THE ROYAL ENGINEERS JOURNAL.

VOLUME XXVI.

JULY TO DECEMBER, 1917.

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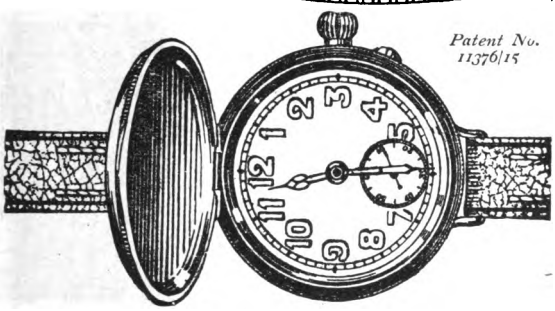


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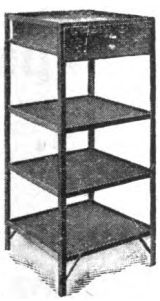

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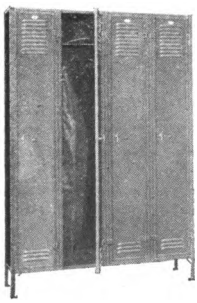

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*Authors alone are responsible for the statements made and the opinions expressed in their papers.*—(G. 5281).

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# *DEEDS OF THE ROYAL ENGINEERS.**

*(Continued from the June number of the "R.E. Journal").*

## CHAPTER VIII.

## ROYAL ENGINEER COMPANY HISTORIES.

(The greater portion of this chapter has been reprinted from an article by Colonel B. R. Ward, R.E., in the *Supplement to the R.E. Journal* for April, 1911).

THE scheme for delimiting the historical spheres of influence of the various companies, outlined in the following chapter, has been referred to the War Office, and has received the approval of the authorities of the Corps.

The following notes are published in order to assist in compiling Company Histories as laid down in Army Order No. 77 of April, 1910. Conolly's *History of the Royal Sappers & Miners* is our chief authority for the early history of the companies of the Corps. The Public Record Office in Chancery Lane, W.C., contains pay lists, muster rolls, and letter books of the old Royal Military Artificer Companies, and should be searched as opportunity offers. I have lately been through Conolly's *History*, and have spent three days searching in the Record Office with the following results :—

At first no numbers were given to the companies. They were known by the name of the station to which they were posted. In 1806 the Corps consisted of 12 companies designated by numbers (*see* Conolly's *History*, 2nd Ed., Vol. I., p. 157). As Conolly points out, however, these numbers soon became obsolete owing to the long-established custom of designating them by stations. It is therefore more satisfactory to number them in order of formation and to disregard the numbers given in 1806.

For instance the Gibraltar Companies were in 1806 numbered the 9th and 10th, whereas the 1st Soldier Artificer Company was raised at Gibraltar in 1772, and the 2nd Soldier Artificer Company was formed at the same station in 1786—a year before the raising of a corps of six companies of the Royal Military Artificers. On the 11th September, 1793, a warrant was signed for raising a corps of Royal Military Artificers for service abroad—in Flanders, the West Indies, and Upper Canada (*see Conolly*, Vol. I., p. 88). It is very difficult

* Compiled in the R.E. Record Office.

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to trace the companies of the Corps through the long war which lasted till 1815. At this time the Corps consisted of four battalions of eight companies in each battalion (*Conolly*, Vol. I., p. 184). In 1817 a complete battalion was disbanded (*Conolly*, Vol. I., p. 247). In 1831 two Canadian companies were disbanded (*Conolly*, Vol. I., p. 286). In 1833 the number of the companies was reduced from 17 to 12 (*Conolly*, Vol. I., p. 290).

In 1837 the number of the companies was the same—twelve—but the establishment of the individual companies was somewhat lower (*Conolly*, Vol. I., p. 306). In 1838 we appear to have reached the low-water mark of the Corps during the 19th century; for on the 1st July, 1839, a company numbered the 10th was added to the establishment (*Conolly*, Vol. I., p. 344) and from this time onward the numbers of the Corps steadily increased.

For purposes of writing company histories, it will probably therefore be best to reserve the numbers one to nine for all the 18th century companies, and for those raised during the revolutionary and Napoleonic Wars.

From a letter dated 18th October, 1787, which I found in the Record Office in the letter book of the Gosport Company of Royal Military Artificers, the order of the six companies to be raised in that year is given as follows :—

| | | |
|---|---|---|
| Portsmouth. | Plymouth. | Woolwich. |
| Gosport. | Chatham. | Guernsey and Jersey. |

If we number the Gibraltar Companies 1 and 2, Portsmouth becomes 3, Gosport 4, etc., and the Guernsey and Jersey Company becomes No. 8.

It is a curious coincidence that the present 4th Company of the Corps is stationed at Gosport. The Corps of Foreign Service Companies authorized in 1793 may be numbered 9, and the doings of the various companies throughout the Great War may be credited, so far as they can now be disentangled, to the first eight companies who furnished detachments for service abroad, or to the 9th Company in the case of entirely new organizations.

After the formation of the 10th Company in 1839, the tracing of the companies by means of their numbers is comparatively plain sailing.

The following table shows my suggestion for delimiting the historical spheres of influence of the first nine companies of the Corps :—

| Present No. | When Formed. | Reference. | Original Title. |
|---|---|---|---|
| 1. | 1772 | *Conolly*, 2nd Ed., Vol. I., p. 1 | The Soldier Artificer Company. |
| 2. | 1786 | ,, ,, ,, p. 43 | 2nd Soldier Artificer Company. |

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| Present No. | When Formed. | Reference. | Original Title. |
|---|---|---|---|
| 3. | 1787 | *Conolly*, 2nd Ed., Vol. I., p. 64 | The Portsmouth Company of R.M. Artificers |
| 4. | ,, | ,, ,, ,, ,, | The Gosport Company of R.M. Artificers. |
| 5. | ,, | ,, ,, ,, ,, | The Plymouth Company of R.M. Artificers. |
| 6. | ,, | ,, ,, ,, ,, | The Chatham Company of R.M. Artificers. |
| 7. | ,, | ,, ,, ,, ,, | The Woolwich Company of R.M. Artificers. |
| 8. | ,, | ,, ,, ,, ,, | The Guernsey and Jersey Company of R.M. Artificers. |
| 9. | ,, | ,, ,, ,, p. 88 | The Corps of Foreign Service Companies of the R.M. Artificers. |

Further information about these companies and about their successors as renumbered in the years following the Napoleonic Wars will be found as follows :—

*1st Company.*—Conolly's *History*, 2nd Ed., Vol. I., pp. 86, 88, 106, 119, 120, 123 ; Vol. II., pp. 127, 243, 529.

The book in the Record Office numbered W.O. 54/310 is a *Description Book of Royal Military Artificers* enlisted from 1783 to 1807. The earliest enlistment in this book is that of Thomas Elliott, a mason who enlisted at Gibraltar for the Gibraltar Company on the 27th February, 1783.

No letter books of either of the Gibraltar Companies are in the Public Record Office. As the Gibraltar Companies did not form an integral portion of the Corps of Royal Military Artificers till 1797, it is possible that their early records were kept at Gibraltar. It would be interesting to know if any of these records are still in existence.

*2nd Company.*—Conolly's *History*, 2nd Ed., Vol. I., pp. 106, 119, 120, 123, 470 ; Vol. II., pp. 127, 128, 172, 177, 229.

The two Gibraltar Companies were subsequently known—temporarily only—as the 9th and 10th Companies (*see Conolly*, Vol. I., p. 157) ; *History of the S.M.E.*, p. 54.

*3rd Company.*—" The Portsmouth Company of the Royal Military Artificers."

The volume in the Public Record Office numbered W.O. 55/1061 is the letter book of this company from 1792—1808. No doubt much interesting information is to be obtained from this volume, both as to the interior economy of the company, and particulars of drafts sent on active service. The following later references to the 3rd Company of the Royal Sappers & Miners are to be found in

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Conolly's volumes, 2nd Ed., Vol. I., pp. 261, 269, 471; Vol. II., pp. 195, 198.

*4th Company.*—"The Gosport Company of the Royal Military Artificers."

The volume marked W.O. 55/1060 in the Public Record Office is a very interesting letter book of this company from its formation in 1787 to 1810. The second letter in the book is a copy of the letter written by the Master-General of the Ordnance on the 18th October, 1787, directing that a Corps of Royal Military Artificers and Labourers should be raised at the following places:—

| | |
|---|---|
| One company at Portsmouth. | One company at Chatham. |
| One company at Gosport. | One company at Woolwich. |
| One company at Plymouth. | One company at Guernsey and Jersey. |

As the companies are mentioned in the above order officially, the Portsmouth Company may be taken as the 3rd Company, and the Gosport Company as the 4th Company of the Corps. Subsequent references in Conolly's 2nd Vol., 2nd Ed., are as under:—pp. 27(?), 56, 177, 195, 198, 490.

*5th Company.*—"The Plymouth Company of the Royal Military Artificers."

*Conolly*, 2nd Ed., Vol. I., pp. 64, 65, 73—76, 82, 105, 111, 117.

The records of the Dover Company belong to the history of the 5th Company, as the Dover Company appears to have been formed from the Plymouth Company (*Conolly*, Vol. I., p. 105).

Subsequent references to later 5th Companies of the Corps are to be found as follows in Conolly's *History*, 2nd Ed., Vol. I., pp. 272, 276, and Vol. II., pp. 69, 127. *See* also *History of the S.M.E.*, p. 6.

*6th Company.*—"The Chatham Company of the Royal Military Artificers."

The volume marked W.O. 54/313 in the Public Record Office is entitled *Description of the Company of Royal Military Artificers and Labourers commanded by Colonel William Spry, Chatham Barracks, October*, 1787. The book contains a record of enlistments from 1787 to 1814. Subsequent references in Conolly's *History*, 2nd Ed., Vol. I., pp. 261, 265 (the Corfu Company), 290, 291. *History of the S.M.E.*, p. 54.

*7th Company.*—"The Woolwich Company of the Royal Military Artificers."

*Conolly*, 2nd Ed., Vol. I., pp. 64, 65, 73, 99, 112, 114, 116, 121, 157, 184, 248. The records of the "Spike Island Company" should be kept by this company (*see Conolly*, Vol. I., p. 144). The Spike Island Company was temporarily numbered the 7th in 1806 (*see Conolly*, Vol. I., p. 157). Subsequent 7th Companies are alluded to in *Conolly*, Vol. II., pp. 24, 179, 182, 326, 490.

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*8th Company.*—" The Guernsey and Jersey Company of the Royal Military Artificers."

*Conolly*, 2nd Ed., Vol. I., pp. 64, 65, 73, 132, 157 (this company was temporarily numbered the 8th in 1806), 184, 248. Subsequent 8th Companies are alluded to in *Conolly*, Vol. I., pp. 470, and Vol. II., pp. 182 and 198.

*9th Company.*—" The Corps of Foreign Service Companies of the Royal Military Artificers."

*Conolly*, Vol. I., 2nd Ed., p. 88. A Nova Scotia Company first appears in 1796 on p. 104.

Some of the recruits for this company are mentioned in the volume in the Public Record Office marked W.O. 54/311 entitled : *Description of the Corps of Royal Sappers & Miners*, Vol. III. This book contains enlistments in the Corps from 1807 to 1814.

Information regarding the early history of the next 23 companies of the Corps will be found as under :—

C. I.—Conolly's *History*, 2nd Ed., Vol. I.
C. II.—Conolly's *History*, 2nd Ed., Vol. II.

| Present No. | When Formed. | References. |
|---|---|---|
| 10 | 1839 | C. I. 344 ; C. II. 182, 198. |
| 11 | 1841 | C. I. 379, 470 ; C. II. 121, 128, 178, 182, 198. |
| 12 | 1846 | C. I. 469. |
| 13 | 1824 | C. I. 265 (Survey Company). |
| 14 | 1825 | C. I. 266 (Survey Company). |
| 15 | 1846 | C. I. 469. |
| 16 | 1825 | C. I. 267 (Survey Company). |
| *17 | 1847 | C. I. 479 ; C. II. 235. |
| 18 | 1847 | C. I. 479. |
| 19 | 1848 | C. II. 16 (Survey Company), 166. |
| 20 | 1848 | C. II. 16, 166. |
| 21 | 1849 | C. II. 28, 163. |
| 22 | 1849 | C. II. 28, 69, 163. |
| †23 | 1855 | C. II. 255. |
| 24 | 1855 | C. II. 255. |
| 25 | 1855 | C. II. 255. |
| 26 | 1855 | C. II. 255. |
| 27 | 1856 | C. II. 491. |
| 28 | 1856 | C. II. 491. |
| 29 | 1856 | C. II. 491. |
| 30 | 1856 | C. II. 491. |
| *31 | 1856 | C. II. 491. |
| 32 | 1856 | C. II. 491. |

* *History of the S.M.E.*, p. 54.
† *The Training of a Recruit for the Royal Engineers*, Part I., p. 34.

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The history of the first mounted units of the Corps will be found in the *History of the S.M.E.*, pp. 52—54, and in the *R.E. Journal* for 1908, Vol. VIII., pp. 231 and 374.

Up to the present time—May, 1917—the only R.E. Companies whose history has been compiled with any degree of completeness are the 2nd, 4th, and 23rd Companies.

The history of the 23rd Company was published in *The Sapper* from May to August, 1910, and was subsequently reprinted in *The Training of a Recruit for the Royal Engineers*, Part I., pp. 34 to 74.

The history of the 2nd Company was commenced in the January number of *The Sapper* for 1913 and was completed in three parts in the March number of the same year.

The history of the 4th Company appeared in *The Sapper* of June, July, and September, 1913.

It is hoped that other histories will be compiled as opportunities present themselves for conducting the necessary investigations.

It should also be borne in mind that opportunities for obtaining personal recollections of the doings of companies in past campaigns become less and less frequent as years go by. Such opportunities should therefore be seized by all officers and men interested in the history and deeds of the companies to which they belong.

The official histories of R.E. Companies are guarded in the R.E. Record Office.

Personal recollections or historical studies intended for embodiment in Company Histories should be sent for safe custody to the Officer in Charge R.E. Records, Chatham.

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# *MONO-RAIL CAR, IRISH TYPE.*

DESIGNED BY MAJOR A. C. FINNIMORE, R.E.

*By* LT.-COL. A. A. CROOKSHANK, R.E.

THIS mono-rail was designed for use on the Somme-Ancre battlefield, *i e.* on a rough sea of deep and soft mud. The 60-cm. Decauville light railway, if laid on the surface in the usual manner, soon disappears into the mud when man power is used. The man power also has been known to disappear into the mud. If heavy trollies are used necessitating animal power, then the track must be stone ballasted or given some form of hard roadway; and stone ballast, owing to the demands of roads, is often not procurable. If procurable it is expensive to maintain both in men and materials owing to the damage done by the animals' hoofs.

The next stage—if still heavier trollies or long up gradients are used—is machine power (petrol or steam). This necessitates scrapping the Decauville sleepers and re-sleepering with long wooden sleepers either placed very close together or with stone ballast in addition. It is a very expensive type of track, and in any case machine power could not possibly be used in the forward trench area for which this mono-rail was designed.

Again a flat formation say 3 ft. wide involves a lot of work over ground which consists almost entirely of shell holes with narrow knife-edge ridges in between. A single rail carried on posts or hand-driven piles is quickly laid, is cheap in material, provides a firm and durable foundation and is air-photo proof (the line would photo as an infantry track of wooden gratings); it is also economical in power and silent running. The 60 cm. Decauville track has none of these advantages.

The Irish outside car pattern trollies would, of course, take up, from broad-gauge rail head or lorry head or horsed-wagon head 400 lbs. of first line trench requirements, such as rations, munitions or engineering materials and would bring back wounded or salvaged articles.

The object of the design is to carry loads up to 400 lbs. weight on a single track consisting of a light rail such as the Decauville 9-lb. rail. The rail is laid on pickets, driven vertically. The ground therefore requires no levelling.

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The only preparation normally required for the rails consists in drilling or punching in the flange, two holes at each end and one every 6 ft. along each rail. The rails are then fixed to the pickets by nails.

The car consists essentially of:—

(1) A Trolley or Bogey (with two wheels normally).

(2) A pair of cross beams.

(3) Two trays suspended from the cross beams.

In the present design the Bogey consists merely of two boards on edge with distance pieces or chocks. The wheels revolve on bolts put through both boards. The cross beams are of deep section tapered for lightness, and stiffened by cross bracing to take the thrust when the car is pushed along by a man leaning against one arm of the cross beam.

The trays, which should be of the lightest possible description (consistent with strength sufficient to carry a man on a stretcher), depend for suspension upon straps of hoop iron only. A wooden frame is fixed at each end to prevent swinging. It is intended to take no weight through its own fastenings. The trays should be low enough to bring the centre of gravity of the whole car when empty slightly below the top of the rail, so that the car will remain in stable equilibrium. When loaded the centre of gravity will generally be lowered considerably, and the stability correspondingly increased.

Double flanged or pulley wheels with flat tread and coned flanges with ample clearance between them for the bulb of the rail give the best results.

The height of the rail need be no more than sufficient to keep the trays off the ground when swinging slightly. A clearance of 1 ft. is ample for this. The rail need not be therefore much over 2 ft. higher than the pathway, while in places as in gulley crossings, it can be kept level (although the pathway may dip several feet) merely by using longer pickets.

The stretchers are carried one on each side of the tray. If one side is heavier than the other balance can be adjusted by moving a rifle or portion of equipment or clothing from the heavy to the light side. A difference of only a few pounds does not materially affect the car, while on the move. More accurate balancing than this is therefore unnecessary.

A car fully loaded can be pushed by one man easily on the level and for short distances up slopes not exceeding 1/20. For steeper slopes than this or for long up slopes, a second man is necessary. The second man can push on the off side if there is a double pathway. Otherwise he must pull on a rope made fast to the front cross beam near the bogey. If sharper curves than 25 ft. radius are to be negotiated, or if high speeds are likely, as on long down

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grades, where the cars can be allowed to run by gravity, buffers of flat iron must be fitted to diminish the risk of collision with a post if the car should swing too much. There is however very little tendency to swing except on curves ; on the latter a guard rail can be fixed to the side of the post to limit the swing and at the same time act as a brake if the car should be travelling fast enough to swing out against it.

This is unlikely to occur unless the car is travelling at over 15 miles per hour, a speed which is not entertained in the design although probably quite safe on straight stretches or on specially designed curves with the posts set at an angle to correspond with the probable tilt of the car.

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## *A GOODS CLEARING-HOUSE SYSTEM.*

A PAPER was read at the Society of Engineers by Lord Headley, F.S.E., M.I.C.E. (Ireland), on 7th May, dealing with a proposed Goods Clearing-House System.

The high rates charged by the railways of this country for the inland transport of all classes of merchandise, general goods and agricultural produce, have for many years past exercised a most baneful effect on our trade progress. It is not going too far to say that our commercial activity has been to a large extent paralyzed by the exorbitant cost of transferring produce of any kind from one place to another. Our inland transport rates are more than double what they are in Germany, and are greatly in excess of those in any other country in the world—this should not be so and need not be so. We cannot blame the locomotive, which furnishes us with cheap power over long distances, but we can blame the misuse of the locomotive which is put to shunting work, for which it is unfitted.

Nearly the whole of the wasteful expenditure is due to terminal extravagance and neglect to take advantage of those economical methods which modern engineering science has provided, but which seem to be ignored by railway companies.

It is some eight years ago since Mr. A. W. Gattie and Mr. A. G. Seaman introduced to the public notice the extremely ingenious system of electro-magnetic machinery by which heavy goods and merchandise can be handled as readily as cheques are dealt with by the clerks at the Bankers' Clearing House. During those years explanatory lectures have been delivered in many parts of the country, and practical demonstrations with full-sized machinery in full working order have been frequently given at the works of the New Transport Company at Battersea.

The application of this mechanical sorting and distributing machinery is capable of doing away with the extravagant waste of time, space and money inseparable from the clumsy methods of loading, unloading, shunting, etc., at the termini of all our great railway systems. By means of lofty clearing houses, the third dimension is utilized by escalators, lifts, and electric cranes, which deal with the sorted goods with the utmost dispatch. The machinery does its work so that there can be no congestion, and a few minutes suffice to load or unload trains or motor lorries. Congestion is the product of immobility.

Some idea of the vast utility of the system may be gathered from

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the fact that street congestion would be relieved by the substitution of 5,000 motor lorries for the 120,000 vans which at present block the thoroughfares of London—especially the narrow streets of the City. This, doing away with a large number of slow and cumbersome vehicles and substituting less than 5 per cent. of their number of swift and compact motor lorries, seems far preferable to knocking down houses and spending fabulous sums in street widening.

The actual waste, or dead loss, to this country due to the antiquated methods at the railway terminals such as shunting, misapplication of power, etc., resulting in the non-development of our resources to anything like their just proportions, has been estimated at over £1,000,000 a day.

The problem, therefore, before the scientist and the engineer is one of the greatest importance as affecting the future commercial welfare of this country.

It may be mentioned that Mr. Marconi is one of the founders of the company formed to exploit the above-mentioned inventions and that such authorities as Dr. Hele-Shaw, M.INST.C.E., F.R.S., the late Professor Ayrton, M.INST.C.E., F.R.S., Mr. James Swinburne, M.INST.C.E., F.R.S., Sir John Purser Griffith, M.INST.C.E., have carefully gone into the system and examined the machinery, and have expressed the greatest admiration. The Kaiser's emissaries, Dr. Johannes and Herr von Schawen, who visited the works of the New Transport Company in June, 1914, just two months before the war broke out, spent a long time in careful examination, and took back to Germany a very full report of what they regarded as an "unequalled method of mobilization."

It will not reflect much credit on our acumen or perspicacity if we allow our worst commercial enemies to exploit the invention of Englishmen to their own advantage before we have carefully examined into its merits to see if it is not possible to utilize it to our own advantage.

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# *REVIEWS.*

## PAGES D'HISTOIRE, 1914—1917.

(Librairie Militaire Berger-Levrault, Paris: 5, Rue des Beaux-Arts).

*Continued from R.E. Journal for June,* 1917.

The Editors of the *Pages d'Histoire* series have found it necessary once more to alter the main title of these volumes. No. 126 and the succeeding numbers of the series are published under the main title *Pages d'Histoire,* 1914—1917; No. 124 of the series also bears the dates 1914—1917.

The 123rd, 125th and 127th numbers of the series contain the official communiqués issued by the French Central Government to the Provincial authorities during November, 1916, December, 1916, and January, 1917, respectively, and are the XXV., XXVI. and XXVII. Volumes dealing with this particular matter. Each of these numbers contains appendices giving the text of congratulatory telegrams sent by or to the President of the French Republic during the months to which they refer.

The 124th number is entitled *La Hollande et la Guerre*; it contains thirteen short chapters from the pen of Monsieur Louis Piérard dealing with the situation in Holland. In a short preface Monsieur Piérard informs us that the volume under review contains a summary of the impressions found on his mind concerning the attitude of the Dutch people regarding the Great War, during his sojourn of two and a-half years in Holland.

The people of Holland, he tells us, continue to live their quiet, happy lives and many appear to take little interest in the great tragedy being enacted at their very doors. Some there are who even wear badges in their buttonholes inscribed with the injunction: "Spreekt mij niet over den oorloog" (Don't mention the War to me). We are reminded, however, not to lose sight, on this account, of the magnificent spirit of charity which the Dutch, as have the Swiss, shown for 30 months and more in succouring the helpless victims of the War. On the whole the Dutch detest the *Moffen* (their equivalent for *Boches*) from the bottom of their hearts; they admire France tremendously, but towards Great Britain they display a distrust which at times is puerile. For Belgium they have sincere compassion mixed with a curious feeling of jealousy and with an air of contemptuous and amused affectation of superiority.

The view is expressed that the Dutch Government has to a certain extent sacrificed the interests of the labouring and middle classes by allowing some of the large farmers and exporters to make undue profits out of the situation created by the War. But it is undeniable, says Monsieur Piérard, that the Dutch Government have observed the most scrupulous neutrality and that Jonkheer Loudon, the Dutch Foreign Minister, has shown great firmness and skill. In view of the extremely difficult position in which Holland has been placed, practically between

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an anvil and a hammer, it is necessary to make allowances in judging the attitude of the Dutch people.

The first chapter in the volume deals with the Dutch Press. It is pointed out that there exists side by side with the strictly correct official attitude of neutrality another, the moral or immoral neutrality of the citizen, of the *man in the street*, a reflection of which is to be found in the broad sheets issued daily from the Dutch Streets of Ink, and in the periodical literature of the country. Apart from the attitude of such newspapers as the *Telegraaf*, the *Amsterdammer*, the *Dagblad van Zuid-Holland* and the opinions expressed by contributors to the leading papers published at The Hague and Amsterdam the Dutch Press shows, according to Monsieur Piérard, on the whole a pusillanimity unworthy of a race that has played so great a part in the history of the world and of a people that has for long ages been imbued with such high ideals regarding liberty. These remarks, it is pointed out, are not intended to apply alone to that part of the Dutch Press which is openly and perfidiously Germanophil and forms the mouthpiece of German propaganda. It has been established on irrefutable documentary evidence that certain papers circulating in the Dutch rural areas are entirely controlled by the German Military Authorities in Belgium. Some of the newspapers published in Rotterdam, The Hague and Amsterdam have, it is suggested, shown, as a rule, excessive prudence in dealing with questions affecting the belligerents. Their *leit-motiv* has been as follows:— All the Great Powers are jointly responsible for the War, they have all been guilty of breaches of international law and of acts of cruelty.

The second chapter deals with the violation of the neutrality of Belgium. Monsieur Piérard states that since the violation of the neutrality of Belgium and the commission of the diabolical acts of which the Kaiser's troops have been guilty in Flanders, in the Walloon country, in Lorraine, and at the gates of Paris itself, those who do not live in fear of their own shadows have not hesitated to declare that the name of Germany stinks so offensively in the nostrils of honourable men that not even all the perfumes of Arabia will ever be able to drown the evil smell.

In some cases the views expressed in the Dutch Press on this subject have been strongly condemnatory of Germany but, on the other hand, there are other newspapers which have maintained an attitude of reserve, excusing themselves from expressing an opinion on the pretext that they were merely vehicles of information. Nevertheless although not prepared to criticise the conduct of Germany, the same papers have not hesitated to attack Italy, when the latter entered the lists against the Central Powers. Fortunately, says Monsieur Piérard, the public opinion of Holland has found means to make itself heard through channels other than the Press. Leagues have been founded and these have been carrying on active propaganda work.

The third chapter deals with the Dutch mobilization; it opens with the warning: "O Nederland, let op U saeck" (Oh Holland, beware!). "One is reminded," says Monsieur, "on the banks of the Amstel and of the Lek, of the note of grave warning sounded in the old psalm of Valerius." The Dutch Army was mobilized on the 31st July, 1914, that is to say, even before the date that the Belgian Army was called out. Since then it has been continually increased in numbers

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(notably in 1915 by a Law extending service in the Landsturm); subjected to intensive training; equipped with the most modern appliances that the present War has shown to be necessary for an army. The only fear which exists is that there may not be sufficient ammunition in hand and that long range guns may be able to bombard Amsterdam from the borders of the inundation zone. No one would wish, says Monsieur Piérard, that Holland should be forced into a position to exhibit to the world the fighting capacity of her new army or that she should be drawn into the conflict, except in the event of her independence being threatened or her honour assailed. No one desires Holland to go through experiences similar to those suffered by Belgium. Moreover, the defence of Holland, based as it is on a scheme of inundation, *i.e.*, on the Waterlinie, would involve the sacrifice of one of her richest provinces, a province as difficult to defend as the Belgians found the task of defending their own province of Luxemburg. In spite of this adverse military situation, there are Dutch people who feel, and say outright, that their country ought from the very outbreak of the War to have at once gone to the assistance of poor Belgium, so odiously attacked and tortured.

It is urged that the moral effect on neutral countries would have been great had Holland thus ranged herself on the side of Belgium. This action would have appealed to Neutral Powers as an eloquent symbol, representing as it would have done the spontaneous fusion into a Defensive League of the small nations against the Colossus, the felon neighbour. It is perhaps now too late for Holland to play the part that the Dutch friends of Belgium would have wished her to do; however, the moderate section of the Dutch Press continues to point out that if the end the Germans have in view is still directed towards the absolute military hegemony, in Europe, of Germany and the relegation of Belgium to a condition of tutelage under German sway then the interests of Holland are indeed seriously menaced. Germany established in undisputed possession of Zeebrugge or Antwerp would mean the early death of Holland as a Power. Eminent men in Holland such as Colenbrander, the historian, and Niermeyer, manager of the *Gids*, have not hesitated to express the opinion that their country should range itself on the side of the Entente Powers the moment that Germany shows any clearly defined intention of permanently retaining Belgium under her own control and governance. But to-day when Germany is on the defensive it is hardly likely that any official declarations will be made on the subject.

The danger that Holland runs at the present time is, says Monsieur Piérard, of another kind. It arises from the promiscuous U-boat and aerial warfare being carried on by Germany against belligerent and neutral merchant shipping alike. So far as the attacks on Dutch vessels are concerned, it is pointed out that the patience of the Dutch people has been tried to the utmost, and soon they may no longer be able to suppress their rage. It is suggested that even now, without declaring war, there is no reason why all exports from Holland to Germany should not cease at once. The seriousness with which the present situation is viewed throughout the Low Countries is reflected in the speech made by Queen Wilhelmina at the opening of the Session of the States General in September, 1916, and the comments made, at the same time, in the Press.

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Monsieur Piérard states that to-day there is no longer any doubt that the famous 'alarm' sounded in Holland on the 31st March, 1916, was due to German machinations. The simple step taken by the Dutch Commander-in-Chief of recalling men from leave (too large a proportion of the army being so absent) was cleverly utilized by German agents to set afloat rumours alleging diplomatic tension between Holland and her Western neighbour, the disembarkation of British troops at Flushing and at other Dutch ports, etc., etc. It was hoped thus to befool Dutch public opinion and to cause Holland to rush into the arms of Germany, whose troops would then have at once marched into Queen Wilhelmina's kingdom. But the Dutch are difficult people to befool.

The fourth chapter is entitled "Pan-Germanism and Holland." Take up the Pan-German literature that has poured out from the printing presses of Europe, both before the War and since its outbreak, and it will be seen that its pages teem, as Monsieur Piérard points out, with sentiments threatening the existence of the little kingdom of Holland. Attention is also drawn in this chapter to the fact that in many text-books on geography and in atlases published in Germany it is claimed that Holland, as well as Belgium, the Grand Duchy of Luxemburg, Denmark and Switzerland naturally form part of Greater Germany, *i.e.* the Teutonic Empire of Pan-German dreams. The German publicist, Fritz Bley, has openly declared that the Germans were fools to give their consent, in 1815, to the constitution which erected Holland into an independent State. Monsieur Piérard also calls attention to the remarkable collection of documents relating to Pan-Germanism made by Monsieur C. Andler, in which a fairly complete exposition of the German faith on the subject of Holland's future is to be found. Constantin Frantz, it can be seen therein, goes so far as to insinuate that Holland is unable by herself to administer and derive full advantage from her vast Colonial empire and, in consequence, collaboration with Germany is absolutely essential to her.

Monsieur Piérard gives in this chapter extracts from communications containing the views of German philosophers, publicists, etc. No wise Dutchman can, after reading the views expressed in the various extracts in question, have any doubt as to the general feeling in Germany towards his country and as to the intentions of those who wish to direct the policy which, it is hoped, may lead, to the founding of the Great Teutonic Empire on the settlement of the peace terms at the conclusion of the present world-wide conflict of arms.

Germany has prohibited almost entirely the export into Holland of coal and metallurgical products, materials which are essential to the industries of the latter country. If now Dutchmen lull themselves into a soporific state owing to a false sense of security, they will not fail, within a short time, to have a rude awakening.

The fifth chapter deals with the popular feeling in Holland concerning the War. In spite of their distant kinship, the Dutch have nothing in common with the Germans. The Amsterdam workman, the Rotterdam docker, the cultivated middle classes of The Hague and of Dordrecht hold the *Mof* and Prussianism in intense horror. The peasantry in certain regions alone may, perhaps, possess some vague feeling of attachment to the country of Bismarck; this attitude may be accounted for by the fanaticism born in them out of the propaganda promoting the idea

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of the return to a theocracy, of which Germany has been represented to them as the guardian angel.

The Dutch are above all things neutral. They have a particular leaning towards neutrality; but, however, prudent, patient, and reserved their attitude may be, they are strongly imbued with a sense of justice, with a love for liberty, with a hatred of oppression and of the use of brute force.

Although "*peaceful penetration*" of the Teuton, on an extensive scale, into the Universities and into the business life of Holland has been in progress for some time, nevertheless a very large majority of the *intellectuals* of Holland have from the beginning of the War ranged themselves spontaneously on the side of the Entente Powers. There can be no doubt that the cartoons of Raemaekers, and the powerful articles of the *Telegraaf* and of the two *Amsterdammer* are a true reflection of the strong current of natural sympathy for the Entente group of belligerents.

The sixth chapter is entitled *La Cour, l'Armée, l'Aristocratie.* Ter Spill, the Dutch deputy, who was recently fined 15 florins for the rough handling he gave a *Mof*, moved in the Upper Chamber of the States General that the question relating to the succession to the Dutch throne should be legislated for at once. It is pointed out that the seven or eight claimants to the Dutch Crown are practically all German princes. The Dutch urge that in the event of a failure, in the direct line, of the present reigning family they should be at liberty freely to choose the dynasty that should take its place, as indeed was the case when they elected the representative of the House of Orange in whose descendants the Crown is now vested. The Dutch are deeply attached to Queen Wilhelmina and her little daughter, the Princess Juliana, but are very lukewarm in their attachment to the Prince Consort, owing to the fact that he is of German extraction.

The Dutch Constitution happened to be under revision at the time that Ter Spill's motion came before the States General; however, the Government opposed the discussion of the subject of the succession to the Crown.

Attention is drawn to the fact that the *Duitsche Orde* is of Teutonic origin and the Chapter of this Order consists of individuals the majority of whom are Germans resident in Germany and yet this Dutch Order was established for the special benefit of those of the "blue blood" of Holland. Monsieur Piérard states that in face of this it is perhaps not difficult to explain why it is that 150 Dutch officers are serving as volunteers at the present juncture in the German Army.

There are, of course, men of Dutch blood serving in the French Army, but these *are* drawn from those who had settled in France before the War and were earning their livelihood there.

At the beginning of the War, the Officer Corps in Holland, on the whole, held up German military methods as the model to be exclusively followed by them. They believed in the strategy inculcated in the German Army and in the German system of military education, and many, it is said, held the precepts contained in the Great General Staff handbook *Kriegsbrauch im Landeskriege* in as much veneration and to be as worthy of acceptance as the verities of the four great Evangelists. By degrees, Dutch officers have been changing their earlier views on this subject; they now display sincere admiration for the magnificent military virtues

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of the French and their power of organization. They are also favourably struck with the prodigious effort made by the Britishers.

It is no secret that the people of the Low Countries have a horror of militarism; at the same time it is true that certain officers do not hide the fact that their sympathies are with Germany in the present War. Nevertheless, Monsieur Piérard is convinced that in the case of an attack on Holland by Germany, the Dutch Army, imbued as it is with a proper sense of patriotism, will defend its country with vigour.

The seventh chapter is entitled *La Hollande et le Blocus*. The Dutch Government, it is pointed out, has made loyal efforts and adopted stringent measures to suppress traffic in contraband goods between Holland and Germany. Some idea of the extent to which smuggling has been carried on may be gathered from the fact that at three sittings of the Correctional Tribunal of Ruremonde held on the 20th, 25th and 29th June, 1916, no less than 330 persons were found guilty of exporting or attempting to export merchandise on the contraband list to Germany. Smugglers are said to have been making large fortunes in Holland. It is urged in the Dutch Press that the most effective means for dealing with the traffic in contraband would be to give soldiers and customs officials a monetary reward equivalent to 25 per cent. of the value of goods seized by them.

Monsieur Piérard gives detailed information regarding the great increase which has taken place in the export from Holland into Germany of certain classes of food stuffs. For instance, in the first quarter of 1916, about two-thirds of the fish taken into Dutch ports was consigned to Germany, whereas in 1914 only one-tenth of the total catches were exported to Germany; in the case of cheese the export increased from about 12 per cent. of the whole production in 1914 to about 92 per cent. in 1916.

The eighth chapter is entitled *La Mecque des Pacifistes*. Monsieur Piérard points out that in bygone days Brussels was noted for the number of associations of all sorts,—philanthropic, sporting, musical, etc., that flourished in the Belgian capital; but it is now rivalled in this respect by Holland, where the societies and associations formed are quite as numerous and cover as diverse interests. On the 8th October, 1914, the Dutch added one more to their already long list of societies and labelled it the *Nederlandsche Anti-Oorlogs Raad* (the Dutch Anti-War League), or *N.A.O.R.* On the anniversary of the declaration of War this Dutch organization for procuring an everlasting peace published a list of 1,000 of the other *leading societies* that have affiliated themselves to it for the purpose of carrying out its policy—one which is analogous to that of our own *Union for Democratic Control*. Among the affiliated societies are Pacifist Leagues, Suffragist, Blue-ribbonite, Vegetarian, and Esperantist Associations, also Chambers of Commerce, Political Clubs, etc., etc. The *N.A.O.R.* possesses an international branch; its minimum peace aims are:—

(i.). No annexation or transfer of territory without the consent of the population belonging thereto; such consent to be obtained by a plebiscite if possible.

The Powers to guarantee to the various nationalities within their kingdom or empire equality as regards civil rights, religious liberty and unrestricted use of their own language.

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(ii.). The Powers to introduce free trade in their colonies, protectorates and spheres of influence, or at least equal treatment to all nations alike.

(iii.). Peace Conferences with a view to promoting universal and perpetual peace to be cultivated.

The Powers to create, in addition to the Arbitration Court at The Hague :—

(*a*). A permanent International Supreme Court of Justice.

(*b*). An International Commission of Conciliation.

(iv.). The Powers to reduce armaments. In order to facilitate the reduction of naval armaments, "Prize" to be abolished and freedom of the seas assured.

(v.). Foreign policy to be placed within effective control of Parliaments.

(vi.). All secret treaties to be null and void.

Excellent as are the principles contained in the above aims, the machinery which can be reckoned upon to ensure these principles being carried into effect in their completeness and without fail has not yet been invented ; moreover the task of fashioning such machinery would seem to be of a nature to defy the brains of the most Solomon-like being who has trodden or is likely to tread the soil of our habitable globe. With regard to the programme of the *N.A.O.R.*, Monsieur Piérard remarks that perhaps ridicule does not kill in Holland, but in other countries even the best of schemes succumbs to its attentions. Perhaps, he says, Wilhelm II. will bear the above programme in mind, if bad luck has it that his military and naval forces are victorious !

Monsieur Piérard tells us that the Palace of Peace at the Mecca of Pacifism is at the present time deserted and one might put up a notice board on the gate with the legend *Huis te huur* (To let). Recently he visited this edifice and inquired from the caretaker which was Germany's part. The guardian of the Palace, he says, casting a contemptuous glance at the entrance gates, replied "*Buiten het vredepalais*" (outside the Palace of Peace).

The ninth chapter is entitled *Chez les Socialistes*. There are, Monsieur Piérard points out, socialists in neutral countries, and even amongst the peoples of the Entente group, who cannot persuade themselves that International Socialism can exist without the inclusion of the group belonging to the German *Sozial-Demokratie*. They are not prepared to recognise that a deep abyss separates the French and Belgian socialists from the German socialists, a separation in which fundamental principles are involved. Notions of right and of liberty, the sense of honour are living realities in the minds of French and Belgian socialists ; they are not prepared, as are the German fraternity, to justify the vilest of turpitudes and to worship the most savage type of Imperialism.

The War has given birth, it would appear, to a new School of International Socialism the disciples of which deny that any such duty exists as that of national defence ; at the same time, they are inclined to criticize the doctrines of Marx (that of "economic determinism") and of Dietzgen (that of "dialetic materialism"). The formulas of the earlier schools of International Socialism have to-day completely lost all their value. Monsieur Piérard points out that Holland is a country in which the views regarding socialism are as narrow as those

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concerning religion. The Dutch socialists have failed to look in the face the facts leading to the unchaining of the Dogs of War in August, 1914, and appear to be living in a World of Unrealities. They still persuade themselves that by the shouting of the formula, "*Geen man, geen cent voor mobilisatie*!" ("Not a man and not a penny will we vote for mobilization!") our world can be transformed into an Utopia, and War can be completely abolished.

The tenth chapter is entitled *Internés et Refugiés belges en Hollande.* When Antwerp fell in mid-October, 1914, a stream of refugees poured into Holland and spread itself over the surface of this land, proud of its reputation for hospitality. The unhappy folk who made their way across the northern frontier of Belgium into their neighbour's territory carried with them in many cases their *lares and penates*, as well as their implements of labour; their number has been estimated at nearly a million souls. One half of them, after a few days' stay in Holland, returned to Belgium, whilst others emigrated to France and to Great Britain. Those who have remained in Holland have been distributed between the concentration camps formed for their reception; these numbered, in 1916, about 100,000 men, women and children. The presence of so many Belgians in Holland has naturally had its influence on the manners of the Dutch, and, it is said, more particularly so far as the women-kind are concerned, some of whom, despite Calvinistic imprecations levelled against showiness in attire, have shown a disposition to follow the gay fashions in dress which were the rage, before the War, in certain quarters of Antwerp. The conduct of the Belgian refugees in Holland has, it is said, been exemplary; a few inveterate offenders have naturally given trouble.

In addition to the thousands of refugees to whom reference is made, Holland has extended its hospitality to some 28,000 officers and men who formed part of the garrison of Antwerp during the early German attacks on the famous fortress. The Dutch have never felt happy concerning the juridical situation relating to these men; the Dutch Press appears to have had a good deal to say on the subject.

The eleventh chapter is entitled *Dans les Camps hollandais;* it was written in June, 1915. It is stated that although the Belgian refugees found in some of the large Dutch towns, such as The Hague and Amsterdam, belong, as a rule, to the well-to-do classes yet the greater number of the Belgian refugees in Holland are of the poorer classes; a visit to the concentration camps which lie on a line joining Utrecht and Zwoele presents a most moving scene, for in these camps is really to be seen "Belgium in exile." Everything appears to have been done at these concentration and internment camps to cope with the dangers generally arising from unemployment, inaction, and *ennui*. Schools of instruction for the artizan classes were started in the early days of the War in these camps; up to June, 1915, 13,000 students had attended these schools. The instructors at these schools, some 300 in number, are drawn almost entirely from amongst the more skilled of the refugees themselves. During the first ten months of the War the Dutch Government spent over three-quarters million sterling on the Belgian refugees.

The twelfth chapter is entitled *Les Wallons d'Amersfoort.* Monsieur Piérard expresses the opinion that the lot of the 12,000 Belgian soldiers

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interned at the end of October, 1914, at the Amersfoort Camp is one of the saddest; everything contributes towards rendering their captivity in Holland irksome. The majority of them are ignorant alike of the Dutch language and of the country. They are supplied with a certain amount of literature, but this is in a language not familiar to them; they are also provided with a few games. But no one who has been accustomed to a life of activity can play at skittles, cards or loto all day long, so that time hangs heavily on the hands of the Walloon dwellers in the Amersfoort Camp. Further, the uncertainty of what has happened to their relatives and belongings in the territories occupied by the Huns has naturally added to their mental anguish. Monsieur Piérard visited this camp; the most pressing request made to him by the interned soldiers was for information concerning their homeland.

The last chapter is entitled *Les Prisonniers d'Urk*. The island of Urk, which lies in the Zuyder Zee, was utilized in the early days of the War as the place of internment for the Belgian officers who had withdrawn their parole. It has a peace population of 2,700 souls, mostly fisher folk. The island is noted for the austerity with which worldly affairs are judged and for the strict Calvanism which prevails there; no form of labour is allowed there on the Sabbath. The interned officers were housed in a large villa and bedded down on straw palliasses. They were forbidden all intercourse with the "natives." The guard over them consisted of thirty men, all born and bred in the island, this guard being commanded by an aged naval officer of the old courteous type who, however, had received very strict instructions regarding his duties. Friends and relatives wishing to visit the interned officers have, it is said, to go through a trying ordeal to accomplish their purpose, and the latter are continually subjected to petty annoyances in connection with such visits and on other occasions also. The conditions under which the Belgian officers live in the island are compared to those under which the Great Corsican chafed at St. Helena.

It is hinted that the severity of the treatment meted out to the Belgian officers in the island of Urk arises from the fear that Germany might boycott the herrings now sent to the Fatherland from the island, if more favour was shown them.

The 126th number is entitled *La Course à la Mer et la Bataille des Flandres*. In an introduction we are told that this little volume treats in outline the operations of October and November, 1914, which are generally known as the *Race for the Sea*, the Battle of Flanders and the Battle of Ypres. The first period, that concerned with the *Race for the Sea*, comprises two great battles, *i.e.*, the Battle of the Oise-Somme and the Battle of Arras, of which the history has yet to be written; these battles possess an importance which has not been fully appreciated. To General Foch belongs the imperishable honour of the success attained by the Western Allies at this period.

The account of these operations from the pen of Monsieur René Puaux, is subdivided into seven heads, the text being illustrated by ten sketch-maps which clearly show the positions of the contending armies in the Western Theatre at various dates between the 20th September and 1st November, 1914. The volume concludes with a short appreciation of the personality and career of General Foch.

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In the first section of this volume Monsieur Puaux briefly reviews the situation on the Western Front during the days immediately after the Battle of the Marne. He states that the French Higher Command had no difficulty in divining the plans of the German Great General Staff. Faithful to the teachings of the Berlin War Academy and to the doctrines of all German military writers, the Great General Staff would, it was felt, alone aim at enveloping one of the wings of the Allied Armies. The French right wing, resting as it did on the Swiss frontier, could only be effectively assailed by German troops by the violation of neutral territory. On the other hand, the French left wing, consisting of Manoury's Army, then resting on the Oise, offered a suitable objective at which a blow could be struck under conditions affording an opportunity for manœuvre.

Manoury had been directed, on the 11th September, by the French Generalissimo to collect as large a force as possible on the right bank of the Oise. On the 17th *idem*, Joffre definitely decided to concentrate a force on the French left wing, which would be capable of dealing with the enemy's turning movement; he had on the 15th *idem* reinforced Manoury's Army by an army corps and now brought Castlenau's Army to the left of Manoury's Army. The second phase in this period of the War, known as the *Race for the Sea*, brought into full light the high manœuvring qualities of the French: the successive battles from the middle of September to the middle of November involved more marching on the part of the troops than even at the Battle of the Marne. It was the masterly strategy and the skilful handling of the Allied troops during this phase of the War that was responsible for driving the German Higher Command to have recourse to trench warfare. The belligerent armies were manœuvring on two parallel curved fronts; the fact then that the centres of these curves fell within the territory in possession of the invaders of Belgium naturally gave them an advantage.

The chords along which the German General Staff could move their troops were much shorter than the sinuous routes by which the Allied troops had to march to meet the great German outflanking movement; the German Army should, therefore, have achieved its purpose. However, Joffre lost no time; the *glissement vers le nord* was carried out so rapidly that when the Germans did reach the sea, it was at a point where the waters washed the shores of Belgium and not those of France. That the Germans failed in their object is largely due to the very excellent manner in which the French railways played their part at this memorable period. On certain lines as many as 220 trains were moved daily (up and down). During the months of September, October and November large movements of troops were also carried out by motor-car, 350,000 men being so moved over distances varying from 12½ to 64½ miles.

The second section deals with the events connected with the first movements towards the north. Between the 21st and 26th September the French front was engaged on the line Lassigny-Roye-Peronne. On the 26th *idem* the whole of the German VI. Army commenced a vigorous onslaught on Castlenau's Army (Battle of the Oise-

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Somme) ; in the meantime, the troops under the command of Maud'huy were collecting to the east and south-east of Arras, their concentration in this region being completed on the 30th *idem.* The enemy, who had completely established himself on the Thiepval Plateau, moved northwards parallel to the French front. On the 1st October, Maud'huy sent forward the two Cavalry Corps placed under his orders to operate on the banks of the Scarpe ; they established connection with the Dunkirk garrison and pushed on to Douai.

On the 2nd and 3rd October a part of Maud'huy's Army came into violent collision with a very large German force consisting of two Cavalry Corps and seven Army Corps in the region of Arras and Lens (Battle of Arras). The situation was a serious one and a new French Army Corps was quickly pushed forward by rail and detrained on the line St. Pol-Merville (St. Pol about 30 miles west of Arras). The enemy tried hard to drive the French back with the object of turning their flank. Joffre now ordered the movements in this region (concerning which instructions had already been issued) to be continued, at the same time providing further reinforcement. General Foch was sent to this region with directions to co-ordinate the movements of Castlenau's and Maud'huy's Armies, of the Territorial Divisions and of Conneau's and of Mitry's Cavalry Corps ; he left Chalons on the 4th October, and established his headquarters at Doullens on the following day where he remained till the 24th *idem.*

During the period Foch was at Doullens the movement northward of the Germans and French on parallel routes continued. It was during this manœuvre that the British Army under Field Marshal French was transported to the left of Foch's command and thus once more occupied the same relative position on the Allied front that had been assigned to it in the first days of the War.

A brief reference is made in this section to the proposal made at one time that French troops should take part in the operations projected for the relief of Antwerp. Both General Joffre and Sir John French, it is stated, were of opinion that the dispersion of the French Army for the purpose of undertaking enterprises of the kind in question was to be deprecated on the ground that such operations involved, under the then existing situation in France, undue risks being taken and were, moreover, likely to prove futile. It was urged by them that a preferable course would be to assist the Belgian Army in Antwerp to withdraw on to the front on which the British and French Armies were operating.

The Belgian troops which retired on the 9th October from Antwerp to the Yser *viâ* Eecloo and the coast were, as a matter of fact, covered by 6,000 French Marine Fusiliers transported by rail from Dunkirk to Ghent. The British 7th Division and 3rd Cavalry Division disembarked at Ostend at the end of September ; it had been intended that this force should proceed to Antwerp with the French troops which it had been proposed should be sent there. The British 7th Division eventually joined up with the British troops in the neighbourhood of Ypres and the French Marine Fusiliers fell back, in due course, on to Dixmude and played a heroic part in the defence of this place.

Up to the 23rd October it had proved a by no means easy task to maintain the Allied front intact. The fall of Antwerp released a great part

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of the German troops which had been besieging that fortress. The French Generalissimo, in consequence, decided to move the French Army under General d'Urbal, which had been intended for employment in Belgium, to the north of the Lys; this army had originally consisted of two Territorial Divisions, four Divisions of Mitry's Cavalry Corps, and of one Brigade of Marine Fusiliers. It was reinforced, on the 21st October, by the French 42nd Division. The reinforcement of d'Urbal's Command by new Divisions continued during the whole period over which the Battle of Flanders lasted; these reinforcements amounted in all to the equivalent of five Army Corps, two Cavalry Corps, two Territorial Divisions and 60 heavy guns.

When the Germans launched their great offensive, on the 23rd October, 1914, with the quadruple purpose of (i.) piercing the Allied front, (ii.) reaching Dunkirk, Calais and Boulogne (whence they might bombard the British shores with their Krupp giants and prosecute an intensive submarine warfare with the object of isolating the British Isles), (iii.) outflanking the Allied front by the isolation and destruction of the Allied left wing, (iv.) completing the conquest of Belgium, in order to enable Wilhelm II. to place King Albert's Crown on his own head in the Cathedral of Ypres, the cradle of Belgian liberties, they knocked their heads against a wall of steel too solidly constructed to be broken down by their battering rams; thanks very largely to the steps General Foch had taken to ensure the proper execution of the orders of the French Generalissimo. It is these operations that are known as the "Battle of Flanders."

In the third section of the volume, Monsieur Puaux touches very briefly on the German offensive. He states that the German Armies which marched against the Anglo-Franco-Belgian front were animated with an ardent and excellent offensive spirit: they consisted of new formations that had not yet been under fire. These German troops were ignorant of the defeat suffered by their countrymen on the Marne; on the other hand, they were well acquainted with the fall of Antwerp and the triumphal and rapid march of German Armies through Belgium, and this knowledge naturally caused them to be greatly elated. The idea that France would be completely crushed within a few weeks had not yet vanished from their minds. The check on the Marne was only temporary, they thought, and the battle in which they were about to take part would finally establish German superiority and complete the triumph of the Teuton arms. The Kaiser proceeded in person to Thielt and to Courtrai to encourage his troops by his presence, and the German Press did not cease to impress upon its readers the importance of the operations it was pleased to refer to as the "Battle of Calais."

The fourth section deals with the attack on the coast. The German Great General Staff directed the first blows, during the second half of October, principally against the Belgian Army and attempted to pierce the Allied front between Dixmude and the sea. No doubt, it expected to achieve the results aimed at quickly and easily; assuming probably that the Belgians were completely demoralized. They hoped in a short time to realize their grandiose plan of menacing England directly: the Krupp 16-in. guns and the Austrian 12-in. guns would soon, it was expected, be bombarding Dover and Folkestone.

The French General Staff had so completely read the German mind

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that the Governor of Dunkirk had early in October received instructions to complete all his defence arrangements; *inter alia*, the French 42nd Division and a Brigade of Marine Fusiliers had been sent to reinforce the Belgians, who, at that time, were holding a front of 23 miles on the Yser, on the left of the British front at Ypres.

The German attack on the Belgian positions on the Yser began almost as soon as the Antwerp garrison reached the Allied front. The principal blows were aimed on the short section of the front on the left bank of the Yser. Dixmude was as a bastion to this section of the front. Whilst the Germans were attacking Nieuport, British monitors and destroyers poured shot and shell into the German flank.

On the 20th October, the Germans began a systematic bombardment of Dixmude, and thereby effected a certain amount of material damage in the town. After this preparatory artillery bombardment the infantry attack was launched; it was on this occasion that the dense column formation was first used in the attack by the Germans. For this reason the name of the Yser stands as the symbol of despair, and the butchery that resulted from the adoption of the formation in question has caused a stigma, which can never be removed, to be attached to the German Higher Command.

The flower of the youth of the German Universities were serving in the ranks which were mowed down on those fields. Although the first great onslaught on Dixmude was held up neither the plan of attack nor its method of execution was in any way modified.

The Belgian centre was seriously menaced by the intensity of the blows which fell upon it; the Germans had succeeded in getting 10 battalions and some artillery into the loop of the Yser. On the 24th October, 15 successive assaults were delivered against Dixmude by German troops. The French 42nd Division was pushed forward to support the Belgians who had been obliged to fall back on to the Beverdijk. On the 25th *idem*, the enemy's attack relaxed somewhat. On this date, the Belgian General Staff, acting in concurrence with the French Higher Command, decided to inundate the low-lying region in front of the Nieuport-Dixmude Railway in which the Belgian front now rested, and orders were given accordingly. It would appear that the Germans at first failed to realize the importance of the steps taken by the Belgian General Staff in the matter of the inundations. Within a short time the German soldiers saw water percolating into trenches and on reporting the matter were ordered by their Higher Command to pump out the water and to line the bottoms of their trenches with clay to make them water-tight.

On the 28th October, the sluices on the Beverdijk were opened and the water at once began to flood the region adjacent to the railway south of Nieuport. But before the inundations could form a sufficient protection to the Belgian front it was subjected to violent attacks and the defenders were put in great jeopardy; the Belgian artillery suffered severely during these attacks. Fortunately, French troops were able to move up in the nick of time. On the 31st October, a counter-attack by the French 42nd Division stemmed the German tide. The nights of the 30th and 31st *idem* were particularly trying to the defenders on the Yser front.

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The German attacks were now broken and the inundations began to take their toll in men, guns and material belonging to the enemy. As a parting shot the German heavy artillery bombarded Furnes; no doubt as an exhibition of their rage in being disappointed of their quarry. The French Higher Command now handed over the guarding of the line of the Yser to a Territorial Division, which relieved the 42nd Division on the 2nd November; the latter Division was then moved to the south of Dixmude.

French troops almost immediately made an attempt to regain the right bank of the Yser, but the Germans had been strongly reinforced and were able to drive back the French to the left bank of the river, at the same time gaining a footing in Dixmude. The French Territorials who had been pushed as far forward as Lombartzyde, withdrew, on the 12th November, to the bridgehead on the Yser at Nieuport. Nevertheless, the *Schlacht von Calais* was lost to the Germans.

The fifth section of the volume deals with the operations on the front Dixmude-Ypres. On the 20th October, the Germans had their XXIII. and XXVI. Army Corps opposite this front. On the *same* date the part of this front between Dixmude and Bixschote was held by two Territorial Divisions (belonging to Dunkirk) and the part between Bixschote and Ypres by the British 1st Army Corps. The French 4th, 5th, 6th and 7th Cavalry Divisions were employed in advance of this line.

On the 25th October, the two Divisions of the French 9th Corps, one of which had been to the right and in advance of the British 1st Army Corps and the other in reserve between Ypres and Poperinghe took over the positions held by the British 1st Army Corps on this front.

The French 9th Corps and the 31st Division delivered an attack on Poelcapelle and Passchendaele on the 26th October. The French troops made progress in this region and also in the direction of Gruyterzale, but had to give ground at Bixschote. A prolonged contest raged for the possession of the latter place and it changed hands several times during the closing days of October and the first week of November. Hot fighting, with occasional calms, continued until the 10th November, on which date the Germans launched their great offensive, the culminating episode of the operations on this front. This offensive was directed against the Allied positions on the Yser Canal between Dixmude and Bixschote. The French were at first obliged to retire on the line Korteker Inn-Hetsas. Foch sent forward reinforcements to this locality; the French concentrated their efforts on the operations in progress on the line Dixmude-Ypres; merely holding, for the time being, the German offensive south of Ypres. As the result of hard fighting, by the 15th November, the Germans were completely driven back from the left bank of the Yser Canal.

The sixth section of the volume deals with the operations south of Ypres. It was to the south-east and south of Ypres that decisive results were obtained. In this region the Germans pushed their attacks with unprecedented brutality; they hoped, by piercing the Allied front in this locality, seriously to threaten the communications of the British Army and a part of the French Army. On the 23rd October, the part of the front east and south-east of Ypres was held by the British 4th Army Corps, whilst the British 3rd Army Corps held the front

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Messines-Armentières; a British Cavalry Corps was south of Messines at this time. The German XXVII. Reserve Army Corps and XIV. Army Corps faced the British 4th and 3rd Army Corps respectively and there were four German Cavalry Corps in front of the British Cavalry Corps. On the 24th October the British 1st Army Corps reinforced the 4th Army Corps, and at the same time an Indian Brigade was pushed up to the north of Messines in support of the British cavalry.

By the 30th October, the German attacks had inflicted such casualties on the British that it became necessary to send French troops to reinforce them. By degrees the French 9th and 16th Army Corps and 9th Cavalry Division became absorbed in the section of front held by the British troops. And on the 20th November, the whole of the Ypres salient was being defended by the French.

The Battle of Ypres practically came to an end on the 15th November; the German offensive in this sector having completely failed, with a loss to them of more than 120,000 men.

In the seventh section of the volume the results of these operations are briefly reviewed. Monsieur Puaux says that in smashing the German attack between the Lys and the North Sea the Allies definitely defeated the offensive plan of campaign of the German Great General Staff.

The concentration of more than *eleven army corps*, the presence of the Kaiser on the battlefield, the proclamations and orders of the German Generals all demonstrate how great was the importance which was attached by the enemy to the operations dealt with in the volume under review. Therefore the complete miscarriage of the German offensive acquires more than ordinary significance. The check suffered by the Germans was of political as well as of military importance. Had what remained of the Belgian Army been driven out of Flanders, the Germans would have been able to crow loudly that they had wiped out, at least, one of their adversaries. This satisfaction was denied them. Further, the Allied success prevented the Germans from acquiring gun positions and naval bases on French territory for the attack on England.

These operations also afforded convincing proof of the complete solidarity that existed between the French and British Higher Commands.

The continuance of the hold that the Allies were able to maintain on the front Nieuport-Ypres-Arras had the further advantage that they were able thus to secure more firmly the safety of Paris, in the event of a German thrust against the French capital.

The Allied victory in Flanders was the complement to and the rounding off of the victory on the Marne. On the 15th September, Wilhelm II. and his Great General Staff may still have had illusions and may still have nourished vain hopes regarding the ultimate success of German plans. On the 15th November, such could no longer have been the case; the battle had been lost to them.

In the short appreciation on General Foch's personality and career, which appears in the final section of the volume, Monsieur Puaux says that the Commander whose name will for ever remain associated with the operations connected with the Race for the Sea and the victory in Flanders, operations leading to very far-reaching consequences, was that of a soldier well known to students of War. Many are the officers

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in the French Army who have derived advantage from his instruction, whilst he was Professor of Tactics at the École Supérieure de Guerre, and still more numerous are those who have imbibed useful lessons from his two voluminous works, *Les Principes de la Guerre* and *De la Conduite de la Guerre : la Manœuvre pour la bataille*. These works are a living embodiment of the spirit of their author. Brightness, good-will, uprightness are the attributes of his moral nature ; ingeniousness, preciseness, wideness in the range of scientific knowledge represent the qualities of his talents.

General Foch has deep faith in the Napoleonic doctrines ; his faith, however, is not of that narrow kind which seeks to interpret the sense of the original phraseology of the Great Captain's maxims literally, but it is rather of that broader kind which endeavours to apply the principles contained in these maxims in the light of the most recent technical developments which have added so enormously to-day to the powers of armies in relation to the offence as well as the defence. As was the case with Napoleon who paid attention only to main considerations, economized troops, and made the most of superiority in morale, so also has it been with Foch. Foch's works are full of trite sayings, and a study of the multiple phases of the manœuvres on the Yser reveal how skilfully Foch, the General, has applied the lessons contained in the works of Foch, the author. It is too early in the day, Monsieur Puaux points out, to write of the operations conducted by the subject of this short memoir on the fields of Artois and on the Somme. He contents himself with reminding us of the motto inscribed on the portals of one of the French fortresses : *Le Passé répond de l'Avenir*—the Past justifies Great Expectations in the Future.

The 128th number contains a diary of the events of the War during the period 1st July to 31st December, 1916 ; it is the fifth volume of the series dealing with this particular matter.

W. A. J. O'MEARA.

## THE CALCULATION AND MEASUREMENT OF INDUCTANCE AND CAPACITY.

*By* W. H. NOTTAGE, B.SC.—(Published by The Wireless Press, Ltd. 2s. 6d.)

The important part that the inductance and capacity of an electrical circuit play when alternating currents are propagated along them was early recognized. In telephony and in wireless telegraphy, as is well known, the transmission and propagation of alternating currents of much higher frequencies are involved than those required for ordinary telegraphic purposes or those utilized in connection with electric currents for illuminating or power purposes. The progress made in the sciences of telephony and of wireless telegraphy, as also the treatment of practical problems connected with these two branches of the electrical industry, naturally led in due course to a deeper and deeper study of the theory connected with the generation and transmission of high frequency alternating currents, and many exceedingly valuable contributions have been made

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by mathematicians, physicists and electrical engineers to the literature on the subject. These contributions being scattered in the pages of a very large number of volumes of the Proceedings of scientific societies, such as the Institution of Electrical Engineers and the Physical Society of London, in technical journals and periodicals such as *The Electrician* and *The Wireless World*, and in the publications of certain national institutions such as the Bulletin issued by the Bureau of Standards, Washington, the formulæ, etc., contained in these contributions are not readily accessible for every-day use. The author of the work under review has brought together from various sources a large number of formulæ and many of the methods of measuring inductance and capacity in a form which cannot fail to be useful to those who have to deal with problems connected with high frequency alternating currents. The work in question is divided into six chapters, and concludes with a series of useful tables. The subjects treated in the several chapters are as follows :—

Chapter I.—The Calculation of Inductance.
Chapter II.—The Calculation of Capacity.
Chapter III.—The Measurement of Inductance.
Chapter IV.—The Measurement of Capacity.
Chapter V.—High-Frequency Measurements.
Chapter VI.—Appliances for Use in Measuring Inductance and Capacity.

It is perhaps inevitable that in the first edition of a work of this kind a few misprints should have crept into the pages of the volume. A very large number of the formulæ have been checked and but few errors have been found ; those discovered are either patent or of trivial importance, for example, on page 10, in the formula (7a) for the inductance of a damped wave at high frequencies the value of $L_0$, the continuous current inductance, is found by formula (6), whereas the value actually substituted is that for $L_0$ given in formula (4), being the continuous-current inductance for a low-frequency alternating current. In the part of Chapter II. dealing with the capacity of radio-telegraphic antennæ in formula (18), on page 47, for the average potential in absolute units of a single straight wire the last term is given as ·307, whereas in the original paper by Prof. Howe (published in *The Wireless World*, December, 1914, and January, 1915, and *The Electrician*, August and September, 1914) this term is given as ·309 ; this misprint is repeated in the subsequent formulæ dealing with the same subject.

The errors in question in no way detract from the value of the work under review and it should therefore find a place on the bookshelves of all interested in problems connected with high frequency alternating currents, and particularly of those who have to deal with the practical side of telephony and of wireless telegraphy.

W. A. J. O'MEARA.

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# NOTICE OF MAGAZINE.

*REVUE MILITAIRE SUISSE.*

*No. 3.—March*, 1917.

## ON CAVALRY.

*German Cavalry at the Battle of the Marne.*

The article on the above subject in the number of the *Revue* under review is a continuation of the article begun in the number of the *Revue* for February, 1917 (*vide R.E. Journal* for June, 1917); it is accompanied by a sketch-map of the region east of Paris, lying between the Seine and the Aisne, as far as and including Chalons. It is pointed out that Von Kluck, in abandoning his march on the 4th September, 1914, on a geographical objective, in order to strike at the French Armies, would appear superficially to have been acting according to the dictates of sound strategy. However, Paris was, at that time, something very much more than a mere geographical objective; it was an entrenched camp and was bound to be a serious menace to any army which might move so as to leave it on a flank without detaching a very considerable containing force to watch it.

The change of direction in the march of Von Kluck's Army, says the author of the *Revue* article, must have been approved if it was not actually ordered by the Great General Staff. It seems inconceivable that the latter could have acted without being in possession of very precise information concerning the situation as regards enemy forces in and about the French capital.

The author of the *Revue* article asks: Was Von Kluck ill-served by his cavalry as regards information services? Was he ignorant concerning the concentration of the 6th French Army? Finally, did he not make a mistake in not leaving the whole of Von der Marwitz's cavalry on his right flank, when he deflected his army in the direction of Coulommiers? The author of the original article states that he believes he can, without fear of contradiction, reply negatively to the above questions.

When further details relating to the events of that period of the War are available they should throw a flood of light on the matters raised in the first two of the above questions.

The situation, in the first days of September, 1914, was as follows:—The retreat of the 6th French Army, formerly known as the Army of the Somme, had brought it by the 3rd September, 1914, on to the line Dammartin-Pontoise (covering Paris on the north and approximately 11 miles therefrom), where it came to a halt and faced northwards.

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It had in front of it Von Kluck's Army which extended from Creil to Nanteuil ;* this line was, at Dammartin, about 7½ miles from the French line.

It was on the date last mentioned that the decision was arrived at to alter the direction of Von Kluck's march. Von Kluck, it is said, could not have been ignorant of the fact that the 6th French Army was before him. The German cavalry was feeling for the enemy and ought to have come in touch with the French troops in question. Since the 1st September cavalry patrols had spread themselves well over this region. True, on the German right these patrols must have been much hampered by the extensive forest region to the north of Paris. It is recorded that a German patrol, strength unknown, got as far as Pontoise. More to its left other patrols reached La Chapelle en Serval, Survillers, St. Witz and may be the high ground adjacent to the Senlis-Paris main road and the Creil-St. Denis railway. A good view of the region to its south is obtainable from the last-mentioned locality.

Further to the east the country is quite open and affords a clear field of view. Here the German cavalry patrols were pushed well forward along the depression between the Creil-St. Denis and Nanteuil-Paris railways. On the 1st September a number of German squadrons passed through Ermenonville. On the 2nd *idem* the Germans occupied Lagny-le-Sec (about 23 miles north-east of Paris) ; patrols were sent forward towards Dammartin and Villeneuve, and some of them reached the vicinity of Gonesse (about 6½ miles from northern outskirts of Paris) on the 4th *idem*.

The region of Meaux was also scoured by the German cavalry ; patrols entered Plessis-L'Eveque, Chanconin and Penchard, where the high ground affords suitable observation points.

When General Galliéni learnt, on the 4th September, that the Germans had altered the direction of their march, he ordered a concentration of the 6th (French) Army on its right. This concentration brought the 7th (French) Army Corps to Louvres (about 12 miles north of Paris), De Lamaze's near Menil-Amelot (about 4½ miles south-east of Louvres) and the Territorial Divisions on to the line Tremblay-les-Gonesses (its flanks being about 5 and 3 miles south of Louvres and Menil-Amelot respectively).

The German cavalry should have obtained information concerning the situation in the above region, certainly at least regarding the flanks of the position occupied by the French troops.

The bulletins issued from Berlin announced, with a note of triumph, that since the 3rd September the cavalry of the I. (German) Army had pushed out its " patrols right up to the borders of Paris."

Apart from the information obtained from other sources, Von Kluck ought to have learnt of the concentration of Manoury's Army then in progress from his own cavalry.

It must be borne in mind that the IV. (German) Reserve Army Corps was not taken by surprise. It was the artillery of this corps that first came into action towards noon of the 5th September, from the heights of Monthyon against a French battery which was leaving Yverny (about 5 miles west of Meaux). Although Von Kluck could not have been

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ignorant of the presence of Manoury's Army on his right flank, he was evidently unaware of how it was composed and of its strength. The latter information could not have been obtained for him by a force of cavalry even larger than that he had with him, even if it could have been more boldly handled. Nor could any cavalry have definitely informed him that the enemy was far from being in a state of demoralization, but was making preparations for an energetic offensive. Nor could cavalry have discovered for Von Kluck that in the immediate future further formations of new troops would be issuing from Paris to increase the dangers which already threatened his army in the first days of September.

To the fact that the Great General Staff altogether failed to appreciate the resources of their enemy and to depreciate his tenacity and prowess was it due that Von Kluck was allowed to go off on a wrong tack. The Germans appeared to have been absolutely confident that they would be in Paris within a week. It was further assumed that the British Army was no longer a serious factor in the military situation. The Germans had been able to beat off the first attack of the Army of the Somme quite easily and doubtless felt that any further attacks of the enemy would be repulsed with similar ease. The author of the *Revue* article expresses the opinion that the action taken by the German Great General Staff is to be attributed rather to an error of judgment than to want of information regarding the enemy. The cavalry was not concerned in these false psychological speculations.

In the previous article on this subject it was shown that of the three cavalry divisions of Von der Marwitz's Corps only the 4th Division had been left on the Ourcq with the IV. (German) Reserve Army Corps. So far as reconnoitring duties were concerned, this division was amply sufficient to meet all requirements. The author of the *Revue* article is of opinion that nothing would have been gained by leaving the whole of Von der Marwitz's Corps with the IV. (German) Reserve Army Corps on this occasion. Indeed, he feels that the skilful use which was made of the cavalry south of the Marne between the 6th and 10th September affords evidence that no mistake was made in breaking up the Corps as actually carried out.

It is pointed out that the situation in relation to the Battle of the Marne of greatest interest, as regards the subject under discussion, is that connected with the progress of events on the German right wing on the evening of the 5th September.

The movement which had begun on the 4th September had brought Von Kluck's Army on the following day on to a line parallel to and south of the road Crecy-Esternay (Crecy about 28 miles east of Paris; Crecy to Esternay about 34 miles). The II. (German) Army Corps, which formed the extreme of Von Kluck's command, was on the 5th September facing the British Army. The IV. (German) Army Corps, and the two divisions of Von der Marwitz's Cavalry Corps were to the south-east of Coulommiers (about 37 miles east of Paris). Von Richthofen's Cavalry Corps was to the south, La Ferté-Gaucher (about 53 miles east of Paris) and had the III. (German) Army Corps on his left. A part of the IX. (German) Army Corps (forming the left of the German

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I. Army) was at Esternay and the remainder was to the north of this place. Von Kluck's outposts stretched from Villers sur Morin, by Mortcerf, Vaudoy, to St. Bon.

Von Bülow's Army was echeloned on the left and to the rearward of the I. Army; its X. Reserve Army Corps was at Montmirail, the X. Active and the Guard Army Corps stretched along the road Montmirail-Chalons. The left of Von Bülow's Army rested on Vertus. The VII. (German) Army Corps was retained as a reserve to the north of Montmirail. Von Hausen's Army (XII. Active, XII. Reserve and XIX. Army Corps) continued the German front from Vertus to a point just south of Chalons.

The French Generalissimo had indicated the lines of the Seine-Aube and the region north of Bar-le-Duc as the front on to which the Western Allies should fall back. The French 3rd and 4th Armies occupied approximately the front Bar-le-Duc—Vitry-le-Francois. The 9th Army (Foch) was concentrated between Mailly and Sezanne. On its left, the 5th Army extended from Sezanne as far as Villiers-St. Georges.

The British Army having retired too far to the south was somewhat *en l'air*; it experienced some difficulty in taking up its proper alignment. It had two Army Corps along the road Rozoy-Paris and one about Lagny (on the Marne). Its outposts were placed along the northern borders of the Crecy Forest.

There were gaps in the above fronts on both sides. The Germans had a gap of about 9 miles between the IV. Reserve Army Corps and the II. Army Corps; its width continued to increase as Von Kluck's enveloping movement progressed. At the period of the advance on Provins, the isolation of the IV. Reserve Army Corps was complete.

It was this situation that the French Generalissimo endeavoured to take advantage of; this is clear from his famous *order du jour* of the 4th September.

The gap between the 5th French Army and the British was wider still—Villiers-St. Georges is about 19 miles from Rozoy. The only troops available for maintaining *liaison* at this part of the front consisted of Conneau's Cavalry Corps, located at that time south of the Forêt de Jouy. The roads from Coulommiers and La Ferté-Gaucher to Provins pass through this gap, and it was here that Von Kluck pushed in his masses to envelope the French left, leaving the British on his right as being of no account in the situation.

Joffre's directions were extremely lucid. Manoury's Army was to cross the Ourcq and advance on Château-Thierry. The British were directed on Montmirail, whilst the remaining French armies were each to advance northwards and attack the Germans immediately in front of them.

The German Reserve Corps on the Ourcq appeared likely to be isolated and crushed and the German communications to be threatened.

Von Kluck expected that he would be able to contain the British with his II. Army Corps and to push his IV. Army Corps into the left flank of Franchey D'Esperey's Army.

The execution of the plans prepared for the opposing armies is next

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examined. On both sides the 6th September had been selected as the opening day for a great battle; the first collision actually took place on the Ourcq at midday of the 5th *idem*.

Manoury attempted to drive Schwerin's IV. (German) Army Corps on to the river. In spite of this threat Von Kluck continued his enveloping movement towards the south of the Marne at dawn on the 6th *idem*. The II. (German) Army Corps, to which had been assigned the duty of containing the British, attacked them with great vigour very early in the morning. At the same time the IV. (German) Active Army Corps continued its march in two columns on the roads Coulommiers-St. Just and Coulommiers-Provins; the advanced guards of this corps reached the Melun-Provins road by 8.a.m.

Von Richthofen's cavalry advanced on the left of the IV. (German) Active Army Corps. The 6,000 sabres of this corps were collected to the south of Chartronges astride the road to Provins. Five patrols were sent out by it; their mission was to endeavour to destroy the railways between Melun and Montereau, some 25 to 30 miles distant. It was expected that they would be able to penetrate through the gap left between the British Army and the French 5th Army; but they failed to do so. Two of the patrols returned, whilst three of them were captured; the officers in command of the latter were later brought before a War Council at Chalons, an episode which led to reprisals on the part of the Germans. After the patrols in question had started off on their mission, the main body of Von Richthofen's cavalry moved off towards Provins, to take part in what the Germans at that time seemed to believe would be the final battle of the War—one German officer of high rank was so bold as to announce that he would spend that evening at Fontainebleau.

On their way southwards, it was first necessary for the Germans to take possession of the village of Courtacon which was being defended by French cyclists, belonging probably to Conneau's Cavalry Corps. Some German Chasseurs of the Guard were the first to enter the village named. It was alleged that some civilians in the village had fired on the German troopers and on this excuse a torch was applied to the houses.

The village of Les Murets was next found to be an obstacle to further progress by the Germans; a French battery had taken up a position there. A Uhlan regiment attempted to attack it, but was held up by wire entanglements and had to retire. At 8 a.m. the French battery withdrew and the village passed into German hands. Champcenest further to the south also fell into the invaders' hands, but the German southward progress ceased here. The French resistance now began to be more and more stubborn; it was no longer rear-guards which the Germans had to deal with, but an army preparing to pass to the offensive.

Orders arrived for the German cavalry to halt; its main body was at this time at Beton-Bazoches (about 17 miles west of Provins). On its right the advance of the IV. (German) Army Corps also came to a standstill. The IV. (German) Reserve Army Corps which had been heavily attacked at midday on the 5th September, had on the following day to give ground, particularly on its right wing which was being

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outflanked. This corps was obliged to retire eastward from Brègny on Vincy and found itself driven into a corner on the Meaux-La Ferté-Millon road, about 3 miles from the banks of the Ourcq.

Manoury had pushed the French 8th Division, to the south of Meaux, into the gap between the British Army and the IV. (German) Reserve Army Corps.

Von Kluck's Army was jeopardized; consequently, without loss of time, he ordered his II. Army Corps to move to the support of the German troops in difficulties west of the Ourcq. At 10 a.m. the II. (German) Army Corps broke off its engagement with the British and marched towards the flanks of the IV. (German) Reserve Army Corps. Under the circumstances the IV. (German) Active Army Corps abandoned its march on Provins (its advanced guards, as already stated, had reached the Melun-Provins road). It turned about and retraced its steps northwards; but it did not go to the assistance of the Germans engaged to the west of Ourcq (near Vincy). Its advanced guard halted on reaching La Ferté-sous-Jouarre; at the same time the main body came to a halt in the neighbourhood of Rebais (some 7 to 8 miles south of the Marne). It is suggested that this may have been because the Germans feared that the British might attempt to take advantage of the situation and make a vigorous effort to occupy the gap in the German front.

The withdrawal of the German IV. Reserve and II. Army Corps (consisting of 80,000 men) left a gap of more than 25 miles between the Ourcq and Cerneux (west of Villiers S. Georges) where the right of the III. (German) Army Corps rested. The II. (German) Army Corps when retiring northwards had only left weak rear guards on the Grand Morin.

To cover the gap last referred to, the dangers arising from the existence of which were fully appreciated by the German General Staff, use was made of the two cavalry corps. Two divisions of Von der Marwitz's Corps were assigned to the sector Crécy-Coulommiers; they had in front of them the whole of the British Army. These divisions were able to continue their duties in this sector up to the morning of the 7th September. Von Richthofen's Corps remained at Beton-Bazoches; it had in front of it Conneau's cavalry and the left wing of the French 18th Army Corps. In spite of the presence of the IV. (German) Army Corps south of the Marne, the German cavalry ran, in the opinion of the author of the *Revue* article, considerable risks in the position in which it now found itself. It was, he says, due rather to the inactivity of the British than to the dispositions made and the nature of the *terrain* that the two divisions of Von der Marwitz's Corps were able to maintain their ground throughout the 6th September. It would seem that Field Marshal French only became aware of the retirement of the German II. and IV. Army Corps on the evening of the date last mentioned.

The British cavalry, it is said, was well placed on the British right, and it is asked why did the German retirement escape notice? Was it that the patrols were not well handled? Was it that the British aviators ceased their activities? Can it be that Field Marshal French

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failed to realize that the fighting in progress on the banks of the Ourcq since the previous evening was really closely connected with the battle which was taking place south of the Marne? Whatever may have been the cause, whether the rear guards of the II. (German) Army Corps and the German cavalry were skilfully handled or whether the British were too passive, the fact remains that it was only in the evening that the British advanced guards reached the Crécy-Coulommiers road (representing an advance of about 6 miles on the right wing and 3 miles on the left wing).

The enemy was more aggressive against Von Richthofen's cavalry, nevertheless the latter was able to hold on to the villages of Champcenest, Les Murets and Courtacon. General Franchey D'Esperey had learnt of the retirement of the two German Army Corps even later than Field Marshal French; it was only on the morning of the 7th September that this information first reached the French General in question. It was contained in reports made by French aviators. Thus it was that the Germans were able to effect a hazardous retreat practically without molestation. The German cavalry, says the author of the *Revue* article, played its *rôle* admirably. The Allies were unable to pierce the German screen and made no progress on this part of the front.

In the Esternay sector violent fighting took place between the German III. and IX. Army Corps and the French 18th and 1st Army Corps; the latter towards the evening began to establish their superiority. Foch's Army generally held on to its positions; his centre was engaged with the Prussian Guards, his right wing with the Saxons. The German VII. Army Corps remained to the north-west of Montmirail and did not come into action.

During the 7th September the situation of the two German Cavalry Corps became critical. The gap in the German front behind them increased in width, the IV. (German) Army Corps retired from Rebais in the morning, crossed the Marne and took up a position, in three groups, east of the Ourcq and made ready to come into action. From the casualty lists it would appear that units of the German IV. Active Army Corps took part in the fighting on banks of the Ourcq on the 7th September; however, its main body did not come into action till the following day.

The pressure exerted by Manoury's Army, which had been reinforced by the French 61st Division (brought by rail into the region of Nanteuil-le-Haudoin) and came into action on the left wing, made itself distinctly felt by the Germans. The latter evacuated the country to the mouth of the Marne and the German cavalry was by degrees relegated to its proper functions. Fortunately for this cavalry, says the author of the *Revue* article, the British were not sufficiently active. Consequently Von der Marwitz held his positions at Crécy and at Coulommiers for a part of the day; he would have probably held on to them still longer had not Von Richthofen, in withdrawing his Corps, uncovered the former's left. Von der Marwitz's right was at this time also threatened by the French 8th Division, which was attempting to push in between the rear-guards of the German II. Army Corps and the

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cavalry, he therefore fell back from the Grand to the Petit Morin. The German cavalry occupied the points of passage on the latter river and held on to them until the following day (the 8th September).

The British Army made slow progress. Its cavalry, operating on its right, linked up with Conneau's cavalry about Jouy-sur-Morin (about 22 miles north of Provins). The British 1st and 2nd Army Corps reached the La Ferté-Gaucher-Coulommiers road in the evening. The British 3rd Army Corps had at that time alone crossed to the north of the Grand Morin; it spent the night in the region north of Crécy.

Von Richthofen's cavalry had had great difficulty in withdrawing from the fight during the morning. The Chasseurs occupying Champcenest and Les Murets had been violently attacked; the German cavalry had at the same time to hold the French and British cavalry at bay.

The left wing of the French 18th Army Corps seriously threatened the Germans, who were in fear that the passages of the Grand Morin in their rear might be seized by the enemy. Therefore at 11 a.m. Von Richthofen ordered a retreat to the Petit Morin; his Corps crossed the river at Jouy and at La Ferté-Gaucher and established itself in the sector La Sablonnière-Boitron. Von der Marwitz's Corps shortly afterwards arrived in the region to the right of this sector.

In the evening of the 7th September, therefore, four cavalry divisions were massed on a front of about 9 miles; they had the rear-guards of the German II. Army Corps on their right and that of the IV. Army Corps in the region of Hondevilliers-Viels-Maisons, on their left.

The French and British cavalry did not continue their pursuit beyond the Grand Morin. The Allied cavalry seem to have passed the night of 7th—8th September at La Ferté-Gaucher.

The German III. and IX. Army Corps also felt the reaction caused by the retirement of the German IV. Army Corps. About 8 a.m., the pressure of the French 5th Army caused them to begin a retrogade movement northwards; they passed the night on the Mont Dauphin Plateau, between the Grand and Petit Morin. Their rear guards held on to the slopes north of the Petit Morin, maintaining contact with the French troops.

On the day in question (7th September) the right wing of the French 5th Army advanced some distance to the north of Esternay. Foch's Army, in spite of the furious attacks of the Germans, maintained its position.

The German VII. Army Corps does not appear to have moved from its position north of Montmirail. The author of the *Revue* article sums up the situation as follows:—"Again on this day (*i.e.*, 7th September), the German cavalry fulfilled its task most amply. Although it had to withdraw, still it did not allow itself to become in any way entangled; no part of the envelopment which threatened it came to anything."

The events of the 8th September were contradictory in nature. On the one hand, whilst this was the date on which the five days battle reached its maximum intensity; on the other, it was the date on which Von Kluck withdrew two additional Army Corps to the north of the Marne, without bringing them as a whole into the fight on the banks

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of the Ourcq ; he would thus seem to have considered the battle already lost.

The French 6th Army had been reinforced by the 62nd Division, which prolonged its left wing, and which, with the co-operation of three divisions of Sordet's Cavalry Corps, was employed for the purposes of enveloping the German right wing. The 4th Army Corps which had been taken away from Sarrail's Army was also about to take up a position in the French line. Matters were not, however, altogether satisfactory so far as Manoury's Army was concerned. The German IV. Active Army Corps had crossed the Ourcq and had come into action. It attacked along its whole front ; and Betz was retaken from the French, who in their turn incurred the danger of being outflanked. It looked for a moment as if Joffre's plans were about to miscarry. The French now expected that the German III. and IX. Army Corps, which had retired northward, would intervene in the indecisive combat. However, the Germans were content with throwing three infantry regiments and two artillery regiments into the fight, in passing, whilst the bulk of these two corps continued their march to the north. It has been represented that the reason for the adoption of this course was owing to the fact that it had been decided to carry out urgent defence works in the Aisne position. If this is so, it is evident that Von Kluck had, after the 8th September, no longer any illusions on the situation. He probably felt his position was more compromised than it appeared to be to the French.

The withdrawal of the III. and IX. Army Corps on the morning of the 8th September had created a new gap in the German front which it was necessary to fill up. The task of doing so was assigned to the German cavalry. The front it had to look after was longer than the numbers available justified ; it extended from La Ferté-sous-Jouarre to Viels-Maisons (about 16 miles). On its right, detachments of the German II. Army Corps were doing their best to bar the advance of the French 8th Division on the road Meaux-La Ferté-sous-Jouarre. On its left, a part of the German VII. Army Corps came finally into line.

The Petit Morin is bordered by high banks, the northern of which commands the southern. The line of the river was an easy one to defend, but the points of passage were numerous and it was necessary that all of them should be held.

Von Richthofen had in front of him the British Army of 120,000 men which was marching from the Grand Morin towards the line Viels-Maisons-La Ferté-sous-Jouarre ; his headquarters, at Hondevillers, were connected by telephone with the headquarters of brigades and also with those of the regiments holding the points of passage. Von der Marwitz's Corps occupied the right sector.

Each group had infantry and artillery with it. The bridges at Sablonnière and at Bellot were held and the 5th (German) Cavalry Division, with a battalion of Guard Jägers, were detailed for the defence of the Orly Sector on the right. The fighting was exceedingly tough. An attempt was made to dig trenches, but there were not enough tools ; further, the troops were as yet unaccustomed to this class of work. In

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consequence, very heavy losses were suffered and towards midday some units were reduced to 25 per cent. of their strength.

The French cavalry now appeared on the scene. The Germans would have liked to deliver a charge, but the shrapnels were falling too thickly for any such form of attack to succeed. The German positions were fast becoming untenable; the French had already captured Bellot and Boitron, when at midday orders were given to the German cavalry to retire. The retreat was conducted in good order, but heavy losses were suffered during the retirement.

Von Richthofen's Corps retired to Montfaucon, leaving strong rear-guards along the southern borders of the woods between La Chapelle and Viels-Maisons.

Von Marwitz's cavalry does not appear to have had quite so bad a time. It held on to its positions and on the night of 8th—9th September was on the line La Ferté-sous-Jouarre—Basseville.

During the evening the French 8th Division and the British Army reached the Meaux-Montmirail road. The obstacle of the Petit Morin having been passed progress was more easily made. However, a whole day was spent in covering a distance of 9 miles only. As on the previous couple of days, the German cavalry successfully performed the task allotted to it; the gap between the German I. and II. Army Corps was not penetrated by the enemy, and the right wing of the VII. Army Corps was not turned.

The skilful and energetic part played by the German cavalry was of considerable value, particularly in view of the fact that the neighbouring German infantry (the VII. and X. Army Corps) had been driven out of Montmirail by the French 5th Army.

Along the whole of the front held by Foch's Army the attacks were exceedingly violent. Except the German X. Army Corps which remained on the defensive to the east of Montmirail, all the other German corps made repeated efforts to drive back the French 9th Army. The latter held its ground valiantly and only gave ground slightly in the neighbourhood of Fère-Champenoise.

The furious counter-attacks of the Prussian Guard and the Saxons may have constituted either an expiring effort to break the French line, or an effort to retain as many of the enemy troops as possible south of the Marne in order to relieve the pressure on the banks of the Ourcq. These counter-attacks may have even been undertaken to gain time in order to complete the arrangements for the retreat of the following day. The real reason may probably be disclosed when the history of the War comes to be written.

The events of the 9th September resemble those of the preceding day. The retreat of the German right wing had definitely begun; at the same time the violent attacks by the German left wing continued.

Manoury's Army and the 4th Corps of Sarrail's Army had now come into line; the French 8th Division, which had been operating south of Meaux in support of the British Army being no longer required there was transferred by rail to the extreme left of the Allied front.

The front of the French 6th Army extended from Nanteuil-le-Haudoin

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to Vareddes. Betz was still in German hands, but it was soon to be wrested from them.

The condition of affairs with the German troops on the Ourcq was gradually becoming worse. The British having only German cavalry in front of them were able to make more rapid progress, especially on their right. The British now wheeled to tne left on La Ferté-sous-Jouarre as a pivot, and reached the Marne towards midday. Having crossed the river, the British again came into collision with Von der Marwitz's cavalry, along the road La Ferté-sous-Jouarre—Château-Thierry. Von Richthofen's Corps had gone off in the direction of Dormans, having rejoined the left wing of the German II. Army Corps.

The two divisions of Von der Marwitz's Corps were not able to maintain their positions in face of the British advance for long, and particularly as Conneau's cavalry and the French 18th Army Corps were at this time also marching on Château-Thierry—thus menacing the flank of these two divisions.

Shortly after midday Von der Marwitz informed Von Kluck that he could no longer hold on to his positions. The Germans on the Ourcq ran the danger of being cut off by the British. Von Kluck now gave orders for the retreat of his army. The retirement commenced from the left wing. A counter-attack was made *en l'air* at Bargny. By degrees the Germans drew off in the direction of Soissons; strong rear-guards being employed to delay the enemy. Sordet's cavalry was held up the following day by these rear-guards, on the borders of the Forest of Villers Coterets.

After its retreat, Von der Marwitz's Corps passed the night of 8th—9th September in the neighbourhood of Courchamp (north-west of Château-Thierry). Von Richthofen's Corps does not appear to have offered the same amount of resistance as Von der Marwitz's Corps. On the morning of the 9th September it was in position at Montfaucon and Essises. Trenches had been dug by the Germans, but these were not held for long as the progress of the French 18th Army Corps threatened to cut off Von Richthofen's cavalry from the German II. Army Corps. When the French pressure drove the Germans out of Montmirail, Von Richthofen's Corps became involved in the general retreat; it crossed the Marne at Dormans and halted for the night near Vincelles. A squadron was detached to ascertain the strength of the French force which had already crossed to the north of the Marne at Château-Thierry. This squadron was captured by the enemy after having spent two days in reaching Mont St. Père.

On the German right the battle came practically to an end soon after noon; but it continued on the remainder of the front. Von Bülow's Army was not able to hold on to its positions for long. The attacks of the French 5th Army and 18th Army Corps forced it out of its positions north of the Montmirail-Champaubert road. It retreated from the Marne by the same roads as it had advanced southwards only a few days earlier.

It was in front of Foch's Army that the battle lasted so long. As on the previous day the Prussian Guards and the Saxons attacked with great desperation. The Guards gained some ground at Mondement

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and the Saxons were able to win their way to Salon. On their right the battlefield had been entirely evacuated by German troops and they therefore ran considerable risks by delaying their retreat. The French 10th Army Corps was on their left flank and had but to push forward by the heights of Courjeonnet and of Congy to bring about a disaster. However, the Germans broke off the battle in the evening.

On the 10th September the whole of the Germans to the east and west of Vitry-le-François were in full retreat on the Marne.—(*To be continued*).

## The Instruction of Infantry in Battle Tactics.

The author of the *Revue* article states that many Swiss officers have recently been discussing whether the instruction and training given to the Swiss Army takes sufficiently into account the experiences of the present War and whether in the event of the Swiss Army taking the field the men and units would be capable of meeting the requirements of the situation. The conclusion that the author of the *Revue* article has arrived at is that in many particulars the training of the Swiss Army is insufficient ; it is too often carried out in a haphazard manner, without any definite object in view. It seems difficult, he says, for officers and men to get out of the old rut ; it is so easy and convenient to carry on in accordance with the rules long established which have become a matter of routine. An effort of imagination is wanted to start things on new lines and an application of much energy to carry matters through to a successful issue. It is just this effort and application which, it is stated, is now demanded from the Swiss Army, in view of the fact that the Swiss General Staff have recently issued (in November last), a new training manual entitled *Directives pour l'instruction en vue du combat* for the use of the Swiss Army.

The author of the *Revue* article deals with some of the more important principles enunciated in the above-mentioned manual. As regards what should be taught and the lines on which the instruction should be carried out, he points out that the rational method of preparing a programme of instruction is first to study the nature and characteristics of a modern battle, then to consider what part the various components of an army, *i.e.*, the man, the section, the company, etc., are required to play ; this done, the whole scheme of instruction should be based on the requirements of the situation thus ascertained.

A note of warning is sounded against the danger of training troops exclusively for trench warfare. The opinion is expressed that, if called upon to fight, the Swiss troops would in the first days of a war certainly have to take part in old-time forms of campaigning, in which marching and fighting alternate.

It is pointed out that a large number of works have been published recently dealing with the nature of a modern battle ; among them the following :—

*Les expériences de la guerre actuelle.* Published by the Swiss General Staff.

*Die Champagne-Herbschlacht,* 1915. Published under the authority of the Commander of III. (German) Army, etc., etc.

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Works by Capt. Lafargue.

*Accounts of the Fighting at Loos* (*September*, 1915). Published by British War Office.

It is stated that the contents of the above, and similar publications, will furnish the necessary materials on which to build up a body of instructions. Further, much valuable matter will also be found in the many personal notes concerning the War which have appeared in the Press and in periodicals since the autumn of 1914.

The following characteristics should be borne in mind in organizing the instruction of troops :—

On the defensive : the most essential requirement is that several successive lines of defensive positions must be prepared. The present War has shown that the defenders of a position need no longer regard the piercing of a portion of their front as something so disastrous as to involve the abandonment of the whole position. But in order to reduce the risks arising from a failure to hold back the enemy on a part of a front, it is necessary that a position shall be occupied in depth and provided with suitable defence works.

Troops must be taught that the best method of utilizing such a defensive system is for every individual man, every section, every company, etc., to hold on to his or its particular portion of trench up to the bitter end, even when surrounded and the line of retreat is cut off. Tactics of this nature permit of the defender's reserves being brought up and used in a counter-attack ; further, such tactics have the effect of breaking up the enemy's front into disjointed and, in some cases, into isolated sections which lose cohesion and are at the mercy of the counter-attacking troops. Success can only be obtained under these conditions if each man can be made to realize that the fate of his own side depends upon him individually and that he must make up his mind to beat the enemy. Such is the teaching of the present War ; extracts are given from *Die Champagne-Herbstschlacht* and from Capt. Lafargue's *Étude sur l'Attaque* to support the foregoing views.

Another point of importance on which too much emphasis cannot be laid is the immense value on a modern battlefield of defence works. Too much time cannot be spent in teaching troops to entrench themselves rapidly and to provide themselves with suitable obstacles. A defensive line should consist of *centres of resistance* placed at intervals and connected together by lines of continuous trenches.

The chief features of the attack on an entrenched position such as just described involve the employment of as small a force as possible to mask a main *point d'appui* and the launching of a determined assault against the trenches on its right and left. Should the assault succeed and the *point d'appui* be isolated, operations in the nature of a miniature siege are next directed against the latter by a second line of attackers or by the reserves, whilst the first line attempts to continue its advance.

In order that the attack on either side of the *point d'appui* may succeed, it is evident that the defenders of the *point d'appui* must be prevented from developing a heavy flanking fire. It is one of the prime duties of the artillery, before the attack is launched, to destroy those

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portions of the defence works from which such flanking fire can be brought to bear.

The defenders must naturally adopt measures to meet the enemy's attempt to destroy their flank defences. There are two ways of doing so, viz. : (i.) by organizing the flank defences in depth, or (ii.) by withdrawing the flank defences as far back as possible and masking them against artillery fire. In either case a judicious use of machine guns has been found invaluable in flank positions. Many of the accounts relating to the War tell of the effect produced on the enemy by hidden machine guns coming suddenly into action (*vide* article by Capt. Henri Carré in *Revue des Deux-Mondes* for 15th October, 1916).

On the offensive : the essential requirements as regards the attack consist in the preparation with great completeness of plans for its delivery ; the organizing of the attacking troops in considerable depth ; and the regulation with great minuteness of the movements of the troops and of the fire, particularly that of artillery.

Details in relation to the attack are given in the *Revue* article drawn from Lafargue's *Étude sur l'Attaque* and *Die Champagne-Herbstschlacht.*

For the attack Lafargue gives a front of 1,800 metres to a division (12 battalions).

In *Die Champagne-Herbstschalcht*, it is said, French divisions (12 battalions) attacked on a front of from 1,000 to 1,500 metres.

In summing up the author of the *Revue* article states that the requirements for the attack are as follows :—(*a*). In order to succeed every assault must be delivered by several *successive very dense lines.* Each *line* should consist of what have been termed *waves ;* as the first *wave* of a line is expending its effort, a second *wave* following it should endeavour to complete or actually complete the task allotted to the first *wave,* other *waves* should follow each endeavouring to complete the task allotted to the *waves* which immediately preceded them, until the defence is completely broken down. (*b*). Although each *line* should consist of several *waves,* it should only be expected to deliver a single assault. It therefore becomes necessary to organize the attack so that a *series of lines* may follow one another, each *line* being allotted the task of carrying by assault one of the successive positions of the enemy's defence system in front of them. The *Revue* article contains a very brief summary of the plan of attack advocated by Capt. Lafargue ; fuller descriptions of this plan have been published in the *R.E. Journal* for May and June, 1916, in the reviews of the *article* entitled " How can the German front be pierced ? "

*Regulation of the Movements of Troops and of Fire.*

In an attack then the first thing to be done is to form up the *dense lines* required for the assault along some position sufficiently near the position of the front to be carried, whence the attack can be conveniently launched. The Swiss regulations deal with this matter and are as follows :—

" Thin lines, as little vulnerable as possible, should gradually filter forward, succeeding one another and taking up their positions in the

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firing line; the troops and their leaders should make skilful use of the routes to the front affording cover; full use should be made of fire effect to annihilate the enemy and to assist in the advance to the position whence the assault is to be launched. In the case of open country and in front of a very strong position, movements should take place at night and the line of troops to deliver the assault should be pushed forward as near as possible to the position to be attacked before daybreak, a parallel being constructed from which this line can spring forward to the assault. Communication trenches should be constructed to this parallel from the rear, so as to provide a covered way for the successive lines which are to follow the first line."

So far as the training of troops is concerned, says the author of the *Revue* article, the following points want to be well rubbed in :—

(*a*). The efficacy of fire, particularly that of artillery, is nowadays such that infantry cannot advance unless every means are adopted to facilitate its progress.

For this reason, troops must possess considerable skill in utilizing the features of the ground during an advance and must adopt formations which make for suppleness in movement. Such troops moreover must be powerfully supported by their own artillery right up to the moment of entering the enemy's trenches. This feature necessitates a close bond of union between the two arms.

(*b*). When the attacking infantry arrives in the zone swept by hostile rifle fire, it is incumbent on the attackers to keep down this fire as much as possible as they gain ground.

This can best be done by pushing forward machine guns, which should keep as near to the assaulting lines as possible.

### *The Assault.*

As has been stated, the troops to deliver the attack advance from the *position of assault* by *waves*.

The first phase consists in the advance towards the obstacles to be surmounted. This should be carried out either at the ordinary rate of marching or at the double; the sections should strictly maintain their alignment.

The first *wave* having reached the line of obstacles should open fire. During this time the destruction of the obstacles should be completed by the attacking infantry. From this moment each man must act on his own initiative, and assess his individual value at the highest possible figure.

At this stage the time arrives for the second *wave* to move forward; it may have to pass through the enemy's artillery barrage. In consequence, it falls to the artillery of the attack to afford at this juncture the most efficient support possible to its own infantry.

The attacking infantry may find it necessary to use hand grenades to destroy the enemy's obstacles, should their own artillery not have succeeded in doing sufficient damage thereto. It is therefore necessary that as many men as possible should be trained as bombers.—(*To be continued*).

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## NOTES AND NEWS.

*Belgium.*—A special correspondent writes that the lessons of the present War will be of immense practical value to every army. Ironically, he adds: "But it is necessary that I should here render homage to the advantage the German Army have possessed in one point at least. I refer to the evident progress that its leaders and rank and file have made in the special tactics employed in the War on the civil unarmed population of the occupied territories." He states that, *à propos* of this matter, he recently read, in a Dutch paper, the following remark addressed to a Prussian General:—"Laurels are more cheaply earned at Brussels and at Alost than at Nieuport and at Ypres."

He next refers to the renovation and reorganization of the Belgain Army which has been in progress since the outbreak of hostilities. The task was one which presented considerable difficulties, but the Belgian General Staff handled these with much boldness, energy and goodwill. In consequence, complete success has attended its efforts. The following remarks of a British military critic, who saw the Belgian Army in October, 1914, on the transformation which has taken place are quoted:—"Can this be the army I saw in Antwerp! Can these be the same men, the same officers! What I saw there consisted of a poor, pitiable and miserable lot of men. Here I see real, well-set-up and healthy soldiers."

Among the important steps taken in the reorganization of the Army is the introduction of a certain measure of decentralization; this is due to the fact that in the course of the present trench warfare a marked tendency has shown itself for the battalion to become a veritable tactical unit. In this connection, it is stated that some reformers there are, who have been advocating that each battalion shall have permanently allotted to it its own artillery. The writer of the *Revue* article considers that the adoption of such a course would be a mischievous step to take. In the Belgian Army the brigade is now definitely recognized as the lowest formation which possesses autonomy. These brigades are to-day commanded by young generals, men who made their mark in the early days of the War as battalion commanders.

The selection of Lieut.-General Rucquoy as Chief of Staff (in succession to General Wielemans) has, it is said, been well received by Belgians of all classes and particularly so in the army.

It is pointed out that although the official communiqués might lead one to believe that a complete calm reigned on the Belgian front, yet this is far from being the case; the Germans, it is said, have been showing considerable activity at Steenstraat and Het'sas. The new levies that have been raised have enabled the Belgian Army to take over a part of the front near Ypres, until recently held by the British troops.

*Portugal.*—In a contribution from a special correspondent, it is stated that two events of great political and military importance for Portugal ushered in the New Year, viz.: the Budget for the year 1917—1918 presented to Congress and an official memorandum dealing with the motives that have inspired the Government to provide Portuguese troops for co-operation with the Allies.

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The Budget furnishes striking proof of the dignity and love of independence of the Portuguese people. It consists of two parts, the Ordinary and the War Budget; the former part shows a surplus of £12,000, and the latter a deficit of 26 millions sterling. The Ordinary Budget is accompanied by a review of the financial situation as affected by the War and shows the revenue raised by Portugal and the economies effected in the public services.

The War Budget possesses considerable interest. In a minute attached thereto it is explained that on the declaration of war by Germany, at Great Britain's invitation, Portugal incurred great expenditure in order to prepare her military and naval forces for active participation in the Great Conflict. The measures adopted to meet this *extraordinary* expenditure are set out.

A brief review is also given of the military measures which have been taken by Portugal in relation to the War.

The contribution is, to a great extent, a *résumé* of the Portuguese news given in previous issues of the *Revue*.

At the recent Conferences which have taken place at London and at Paris between Portuguese Ministers and those of Great Britain and France it was definitely decided to employ Portuguese troops on the Western front.

## Information.

*Switzerland.*—The death is announced of Lieut.-Colonel Albert Bonnard; he retired from the Swiss Army a few years ago owing to ill-health. Lieut.-Colonel Bonnard possessed a distinct personality and spent a great part of his life in fighting for truth and liberty.

This number of the *Revue* concludes with a Bibliography which contains notices of a number of books of military interest.

## Supplement.

A further instalment of Colonel Galiffe's work, *L'Occupation des Frontières par les Troupes Suisses en* 1870—1871, is issued with the March number of the *Revue*.

Chapter II. of the section, which deals with the events up to the end of August, 1870, is continued in this instalment. This chapter deals with the measures adopted in Switzerland during the period in question. The orders for the mobilization of the Swiss troops were issued on the evening of the 15th July, 1870, calling out the first levy, which consisted of five divisions. Details of the measures adopted on the issue of this order are contained in this chapter.

The Swiss "Army of Observation" consisted of 41 battalions and 4 demi-battalions of Infantry, 30 companies of Carbineers, 11 batteries of Field Artillery, 10 companies of Dragoons, 6 companies of Guides, 4 companies of Sappers, 5 Divisional Parks, amounting to 37,423 men and 3,541 horses.

In the early days of the War an invasion of Switzerland by a French Army was most feared by the Swiss authorities and the first dispositions of the Swiss Army were carried out to meet such a contingency.

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From the earliest days of the War large numbers of deserters from both the French and German Armies made their way into Switzerland and provided a certain amount of occupation for the Swiss troops.

The commander of the Swiss Army, General Herzog, learnt on the 26th July, 1870, that the French 7th Corps was being concentrated at Belfort; in order to be prepared for any eventualities which might arise owing to this concentration General Herzog drew in the troops on his right nearer to Basle, where his left rested. By the 17th August, the main bodies of the belligerent forces had moved away to such a distance from the Swiss frontier that the Swiss Government felt justified in issuing orders for the demobilization of two of the divisions of the Swiss Army of Observation. By the following day, the dangers of an invasion had still further decreased and the Government, in consequence, issued orders for the demobilization of another complete division and parts of two others. On the 24th August, the demobilization of the detachments of the two divisions last referred to was carried out, but some Franc-tireurs having appeared in Alsace, the Federal Council called up four companies of Carbineers and formed them into a battalion to do duty at Basle.

The Swiss Government still felt that it might be necessary to call out the troops again later and ordered the Cantons to take in hand preparations to meet such a contingency.

The section of the work dealing with the period from the end of August to the end of the year 1870 (Period of Observation) is subdivided into two chapters. Chapter I. deals with "The Belligerents"; it gives the dispositions of the French and German troops in the vicinity of the Swiss frontier.

Chapter II. is entitled "In Switzerland," and deals with the measures adopted in that country to meet the developments taking place in the south-east theatre of operations.

The battalion of Carbineers at Basle had been considered sufficient to provide for the situation arising from the presence of Franc-tireurs on the Swiss frontier, but the approach of a German Flying Column under Von Keller appears to have created some alarm, and, in consequence, two companies of Infantry and one company of Guides were called up on the 19th September to reinforce the Carbineers at Basle, and a brigade was also put on a war footing so that further reinforcements might be available at short notice. The Germans having withdrawn from Mulhausen, on the 20th September, the Swiss troops called up on the previous day to reinforce the Carbineers at Basle were released from duty.

Further alarms and excursions took place in the early days of October. The march of a German force on Belfort caused orders to be issued for the occupation of Porrentruy by a Swiss brigade. The approach of General Cambriels's Army towards the Swiss frontier led the Federal Council to issue orders for the reinforcement of the Army of Observation on the 21st October. However, as the Army of the Vosges retired before the German XIV. Corps, the movements ordered were not carried out.

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On the 2nd November the Carbineers on duty at Basle were released from duty. But on the day following, the movement of German troops between the Vosges and the Swiss frontier recommenced. By the 4th November all the villages opposite the Swiss north-west frontier were filled with Franc-tireurs, who were retreating in great disorder, with the intention of taking refuge in Switzerland. Swiss troops were, in consequence, immediately pushed forward to occupy Porrentruy and the adjacent country. On the 9th November a Uhlan patrol appeared on the frontier in this neighbourhood and was stopped just as it was about to enter Switzerland; by the 11th November a force of 3,000 Germans had collected at Delle.

The investment of Belfort and the retreat of the French towards Lomont had produced quietude in the frontier near Porrentruy, but this was of short duration. Fresh alarms were created in the neighbourhood of Basle by the movements of the German 4th Reserve Division on its way to join Von Werder. This situation was met, without mobilizing additional formations, by moving Swiss troops from Chaux-de-Fonds further north to Porrentruy; the new dispositions were completed by the 19th November.

A part of the section of the work dealing with the events of January and February, 1871 (Defensive Period), is also included in the instalment of the Supplement under review.

Chapter I. is devoted to the Belligerents; it contains a brief reference to the operations of the French "Army of the East" under Bourbaki and of the German "Army of the South" under Manteuffel. Chapter II. is entitled "The Occupation of Porrentruy." The Swiss Government had learnt, towards the end of December, 1870, that the French were making preparations for a great stroke in the East, but the information received was vague and contradictory. Colonel Aubert was therefore sent to Porrentruy on the 3rd January to investigate matters and report on the situation. He reported on the same evening that the troops in and about that town (viz. two battalions) were in his opinion insufficient. He pointed out that owing to the great sympathy which the Swiss of this region had for France the duty of guarding and protecting prisoners and of providing for the observance of strict neutrality was very delicate and onerous. In consequence, he recommended that a brigade should be quartered at Ajoie and that in addition one battalion should also be placed in Basle. On the 4th January, the Federal Council sanctioned the retention of two brigades at Porrentruy.

In the meantime the numbers of the French troops on the Swiss frontier began to increase; on the 5th January, there were 4,500 men with artillery at Tulay, Blamont and Pont-de-Roide. The Swiss Commander at Porrentruy made a request to his Government for further reinforcements. He asked for a brigade, but the Military Department only sanctioned an addition of a demi-battalion. Some changes in the dispositions of the Swiss troops on the frontier were, however, carried out on the 5th January and following days.

During January some of the engagements between the French and German troops in the region south of Belfort took place within view of the Swiss outposts, and the wounded were attended to at Porren-

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truy, where an International Ambulance had been established under a Swiss Medical Officer.

Colonel Aubert in due course submitted a report to the Federal Council; this document is remarkable for the accuracy with which the writer foretold the course of events in the part of the Theatre of Operations adjacent to the Swiss frontier. He also insisted on the necessity of certain measures being adopted to meet the eventualities referred to. Colonel Aubert's recommendations were eventually approved and put into force.

Colonel Aubert was of opinion that there was less danger of Swiss neutrality being violated by French than by German troops; and he recommended measures accordingly.

Chapter III. is begun in this instalment; it is entitled "Occupation of the Western Frontier."

The editors of the *Revue* have issued in advance a part of the appendices consisting of a series of eight sketch-maps; on these are shown the positions at various dates of the Swiss, French and German troops in the zones adjacent to the Swiss north-western frontier.—(*To be continued*).

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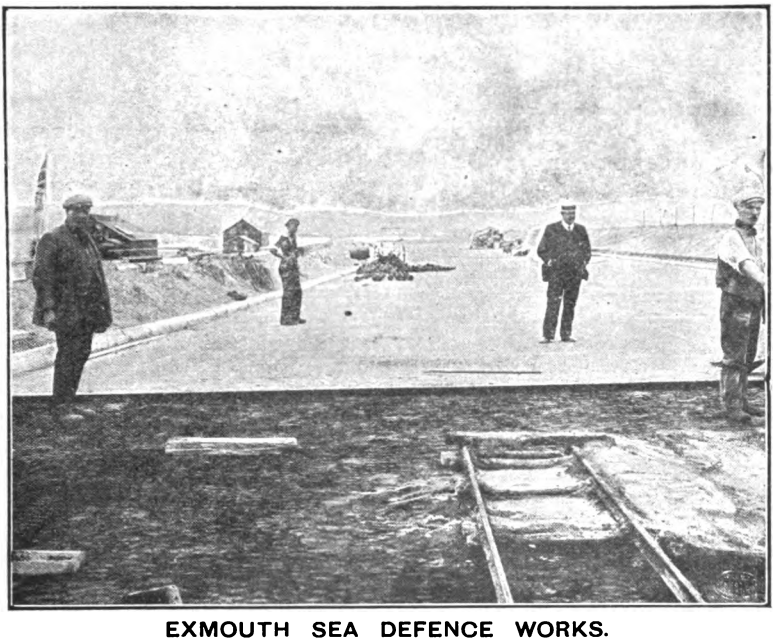

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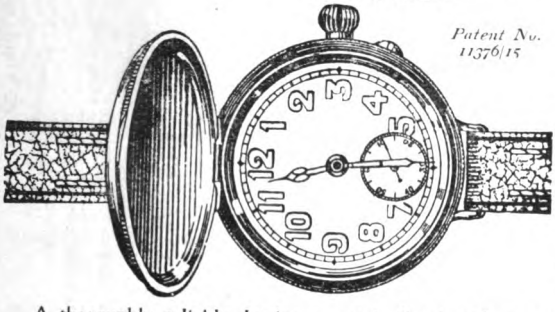

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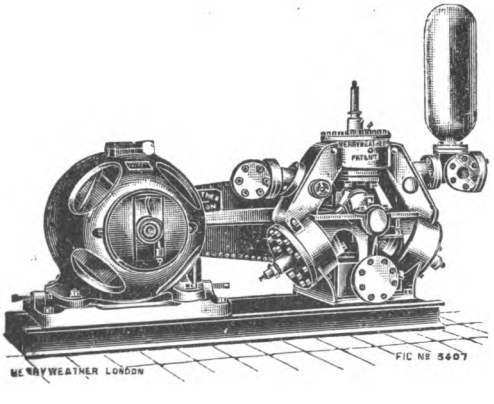


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*Authors alone are responsible for the statements made and the opinions expressed in their papers.*—(G. 5281).

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## *TABLE OF DIMENSIONS FOR SUSPENSION BRIDGES.*

*By* LIEUT. J. E. SWINDLEHURST, R.E. (T.), B.A. (Cantab.), A.M.I.C.E.

THE accompanying tables have been compiled with a view to presenting in a readily understandable form those details which it is necessary to know before it is possible to construct a suspension bridge.

The minimum and maximum spans, viz. :—80 ft. and 200 ft., have been chosen as representing the more usual gaps over which a bridge of this type would be constructed, but in no sense are they to be taken as representing finality in this direction.

The question of the number and size of the bays for any given span is a very debatable one. One point however must always be borne in mind. To ensure an even stress throughout the suspending cable it is necessary to attach a sling at its lowest point. From this it follows that an odd number of slings must be employed and consequently an even number of bays must result. This is a most important point and must not be lost sight of. The length of bay is usually determined by the length of the material available for road-bearers, etc., the lengths suggested in the tables being those which have been proved by practical experience to give the best results in the span under consideration.

Passing from this point to the length of sling required it will be noticed that in no case is the length of the centre sling taken as less than 3 ft., though it is in some cases more than this. The reason for the variation is to be found in the column devoted to "Height of Pier." For the purpose of this table this measurement is taken as the distance between the ground level of the bank of the gap and the cap-sill on which the cables rest. It has been established by experience that it is not practicable to give the necessary head-room and to so attach the diagonal braces as to give the necessary lateral stability if the height of the pier be less than 15 ft. Now since this height is the sum of three measurements namely, the dip, camber, and length of centre sling, and the first two of these for any given fraction of the span do not permit of variation, the necessary addition must be brought about by the lengthening of the sling.

Attention is also drawn to the last two columns in each table, namely, those dealing with the length of cable required and the size of that cable. In the former case sufficient length has been allowed for the turn round the anchor log and the seizing but a slightly longer

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length may be taken with advantage if the stores available will permit of this.

In the latter case it will be noticed that the size is given to the nearest ½ in.; in practice, although a large "factor of safety" is employed throughout, the next larger should be employed. For example, if the calculation gives the size as 8·5 in. employ a 9 in.

It must be clearly understood that all these figures are based on the supposition that due care has been exercised in the selection of site, anchorages, etc., and that material of good average standard can be drawn on. The *utmost* care should be taken that nothing of a doubtful nature is employed in the construction.

The formulæ, etc., on which these figures are based are those given in the *Manual of Military Engineering*, Parts 3A and 3B, and all results may be taken as accurate to the second decimal place.

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# SUSPENSION BRIDGE.

*Calculated to carry Infantry in File (crowded at a check).*

| Span. | Bays. | Dip. | Height of Pier. | Size of Anchor Log. | Depth of Anchorage. | Jk. for Cable. | Jk. for Anchorage. | Slings. | | | | Tension at H. | Length of Cable. | Size of Cable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Centre | 3 & 5 | 2 & 6 | 1 & 7 | | | |
| ft. in. | ft. | | ft. | ft. in. | ft. in. | ft. | ft. | ft. | ft. | ft. | ft. | lbs. | fath. | in. |
| 80 0 | 10·00 | a/10 | 15·00 | 18 × 12 | 5 0 | 37·50 | 50·00 | 5·66 | 6·50 | 8·33 | 11·16 | 56,160 | 73 | 5·0 |
| ,, | ,, | a/11 | ,, | ,, | 5·50 | 41·25 | 56·375 | 6·40 | 7·18 | 8·86 | 11·49 | 60,944 | 77 | 5·0 |
| ,, | ,, | a/12 | ,, | ,, | 5·50 | 45·00 | 61·50 | 7·00 | 7·75 | 9·33 | 11·75 | 65,728 | 80 | 5·5 |
| | ,, | a/13 | ,, | ,, | 5·50 | 48·75 | 66·625 | 7·52 | 8·23 | 9·72 | 11·98 | 70,720 | 82 | 6·0 |
| | ,, | a/14 | ,, | ,, | 5·50 | 52·50 | 71·75 | 7·89 | 8·58 | 9·91 | 12·10 | 75,712 | 87 | 6·0 |
| | ,, | a/15 | ,, | ,, | 5·50 | 56·25 | 76·875 | 8·33 | 9·00 | 10·34 | 12·33 | 80,704 | 90 | 6·5 |
| | | | | | | | | Centre | 4 & 6 | 3 & 7 | 2 & 8 | 1 & 9 | | |
| 90 0 | 9·00 | a/10 | 15·00 | 18 × 12 | 5·50 | 37·50 | 51·25 | 4·50 | 5·16 | 6·54 | 8·64 | 11·46 | 63,180 | 78 | 5·5 |
| ,, | ,, | a/11 | ,, | ,, | 5·50 | 41·25 | 56·375 | 5·32 | 5·94 | 7·23 | 9·16 | 11·76 | 68,562 | 81 | 6·0 |
| ,, | ,, | a/12 | ,, | ,, | 5·50 | 45·00 | 61·50 | 6·00 | 6·60 | 7·80 | 9·60 | 12·00 | 73,944 | 84 | 6·0 |
| ,, | ,, | a/13 | ,, | ,, | 5·50 | 48·75 | 66·625 | 6·80 | 7·38 | 8·51 | 10·19 | 12·43 | 79,560 | 88 | 6·5 |
| ,, | ,, | a/14 | ,, | ,, | 6·00 | 52·50 | 73·50 | 7·07 | 7·63 | 8·70 | 10·28 | 12·38 | 85,176 | 92 | 6·5 |
| ,, | ,, | a/15 | ,, | ,, | 6·50 | 56·25 | 81·45 | 7·50 | 8·04 | 9·06 | 10·58 | 12·54 | 90,792 | 96 | 7·0 |
| | | | | | | | | Centre | 4 & 6 | 3 & 7 | 2 & 8 | 1 & 9 | | |
| 100 0 | 10·0 | a/10 | 15·00 | 18 × 12 | 5·50 | 37·50 | 51·25 | 3·33 | 4·06 | 5·60 | 7·93 | 11·06 | 70,200 | 80 | 6·0 |
| ,, | ,, | a/11 | ,, | ,, | 5·50 | 41·25 | 56·375 | 4·25 | 4·94 | 6·36 | 8·52 | 11·40 | 76,180 | 84 | 6·0 |
| ,, | ,, | a/12 | ,, | ,, | 5·50 | 45·00 | 61·50 | 5·00 | 5·66 | 7·00 | 9·00 | 11·66 | 82,160 | 88 | 6·5 |
| ,, | ,, | a/13 | ,, | ,, | 6·00 | 48·75 | 68·25 | 5·65 | 6·29 | 7·54 | 9·42 | 11·90 | 88,400 | 92 | 6·5 |
| ,, | ,, | a/14 | ,, | ,, | 6·50 | 52·50 | 75·25 | 6·20 | 6·82 | 8·00 | 9·77 | 12·10 | 94,640 | 96 | 6·5 |
| ,, | ,, | a/15 | ,, | ,, | 6·50 | 56·25 | 50·625 | 6·66 | 7·27 | 8·40 | 10·06 | 12·27 | 100,880 | 99 | 7·0 |
| | | | | | | | | Centre | 4 & 6 | 3 & 7 | 2 & 8 | 1 & 9 | | |
| 110 0 | 11·00 | a/10 | 15·83 | 18 × 12 | 5·50 | 39·58 | 53·33 | 3·00 | 3·81 | 5·50 | 8·07 | 11·52 | 77,220 | 86 | 6·0 |
| ,, | ,, | a/11 | 15·00 | ,, | 6·00 | 41·25 | 57·75 | 3·16 | 3·93 | 5·50 | 7·87 | 11·04 | 83,798 | 89 | 6·5 |
| ,, | ,, | a/12 | ,, | ,, | 6·50 | 45·00 | 64·50 | 4·00 | 4·73 | 6·21 | 8·41 | 11·34 | 90,376 | 93 | 6·5 |
| ,, | ,, | a/13 | ,, | ,, | 6·50 | 48·75 | 69·875 | 4·47 | 5·18 | 6·56 | 8·62 | 11·34 | 97,240 | 97 | 7·0 |
| ,, | ,, | a/14 | ,, | ,, | 6·50 | 52·50 | 75·25 | 5·31 | 6·00 | 7·30 | 9·25 | 11·82 | 104,104 | 100 | 7·0 |
| ,, | ,, | a/15 | ,, | ,, | 6·50 | 56·25 | 80·625 | 5·83 | 6·50 | 7·75 | 9·58 | 12·01 | 110,968 | 103 | 7·5 |

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## SUSPENSION BRIDGE—*cont.*

*Calculated to carry Infantry in File (crowded at a check)—cont.*

| Span. | Bays. | Dip. | Height of Pier. | Size of Anchor Log. | Depth of Anchorage. | Jk. for Cable. | Jk. for Anchorage. | Slings. | | | | | | Tension at H. | Length of Cable. | Size of Cable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Centre | 5 & 7 | 4 & 8 | 3 & 9 | 2 & 10 | 1 & 11 | | | |
| ft. in. | ft. | | ft. | ft. in. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | lbs. | fath. | in. |
| 120 0 | 10·00 | a/10 | 17·00 | 18 × 12 | 6·00 | 42·50 | 57·50 | 3·00 | 3·66 | 5·00 | 7·00 | 9·66 | 13·00 | 84,240 | 93 | 6·5 |
| ,, | ,, | a/11 | 15·90 | ,, | 6·50 | 43·725 | 61·60 | 3·00 | 3·63 | 4·87 | 6·73 | 9·17 | 12·06 | 91,416 | 95 | 7·0 |
| ,, | ,, | a/12 | 15·00 | ,, | 6·50 | 45·00 | 64·50 | 3·00 | 3·61 | 4·77 | 6·50 | 8·77 | 11·60 | 98,592 | 97 | 7·0 |
| ,, | ,, | a/13 | 15·00 | ,, | 6·50 | 48·75 | 69·875 | 3·77 | 4·36 | 5·46 | 7·08 | 9·20 | 11·85 | 105,080 | 100 | 7·5 |
| ,, | ,, | a/14 | 15·00 | ,, | 7·00 | 52·50 | 77·00 | 4·43 | 5·00 | 6·04 | 7·57 | 9·56 | 12·04 | 113,568 | 104 | 7·5 |
| ,, | ,, | a/15 | 15·00 | ,, | 7·00 | 56·25 | 82·50 | 5·00 | 5·55 | 6·54 | 8·00 | 9·88 | 12·16 | 120,056 | 108 | 8·0 |
| | | | | | | | | Centre | 5 & 7 | 4 & 8 | 3 & 9 | 2 & 10 | 1 & 11 | | | |
| 130 0 | 10·83 | a/10 | 18·16 | 18 × 12 | 6·50 | 45·40 | 61·65 | 3·00 | 3·72 | 5·16 | 7·33 | 10·21 | 13·84 | 91,260 | 99 | 6·5 |
| ,, | ,, | a/11 | 16·96 | ,, | 6·50 | 46·75 | 64·125 | 3·00 | 3·69 | 5·03 | 7·04 | 9·69 | 13·01 | 99,034 | 101 | 7·0 |
| ,, | ,, | a/12 | 16·00 | ,, | 6·50 | 48·00 | 67·50 | 3·00 | 3·66 | 4·92 | 6·79 | 9·25 | 12·33 | 105,808 | 103 | 7·0 |
| ,, | ,, | a/13 | 15·16 | ,, | 7·00 | 49·27 | 72·02 | 3·00 | 3·64 | 4·83 | 6·58 | 8·89 | 11·76 | 114,720 | 105 | 7·5 |
| ,, | ,, | a/14 | 15·00 | ,, | 7·00 | 52·50 | 77·00 | 3·55 | 4·17 | 5·30 | 6·95 | 9·11 | 11·80 | 129,632 | 108 | 8·0 |
| ,, | ,, | a/15 | 15·00 | ,, | 7·00 | 56·25 | 82·50 | 4·18 | 4·78 | 5·86 | 7·42 | 9·47 | 12·00 | 131,144 | 111 | 8·0 |
| | | | | | | | | Centre | 6 & 8 | 5 & 9 | 4 & 10 | 3 & 11 | 2 & 12 | 1 & 13 | | |
| 140 0 | 10·00 | a/10 | 19·33 | 18 × 12 | 6·50 | 48·325 | 64·58 | 3·00 | 3·62 | 4·81 | 6·57 | 8·90 | 11·81 | 15·29 | 98,280 | 105 | 7·0 |
| ,, | ,, | a/11 | 18·06 | ,, | 6·50 | 50·00 | 68·535 | 3·00 | 3·59 | 4·70 | 6·34 | 8·49 | 11·16 | 14·37 | 106,652 | 106 | 7·0 |
| ,, | ,, | a/12 | 17·00 | ,, | 7·00 | 51·00 | 72·00 | 3·00 | 3·59 | 4·63 | 6·15 | 8·14 | 10·61 | 13·56 | 114,424 | 108 | 7·5 |
| ,, | ,, | a/13 | 16·10 | ,, | 7·00 | 52·325 | 75·075 | 3·00 | 3·55 | 4·52 | 5·94 | 7·85 | 10·15 | 12·87 | 123,760 | 110 | 8·0 |
| ,, | ,, | a/14 | 15·33 | ,, | 7·00 | 53·655 | 78·155 | 3·00 | 3·53 | 4·48 | 5·84 | 7·60 | 9·76 | 12·35 | 132,496 | 111 | 8·0 |
| ,, | ,, | a/15 | 15·00 | ,, | 7·50 | 56·25 | 84·375 | 3·33 | 3·85 | 4·76 | 6·00 | 7·71 | 9·75 | 12·19 | 141,232 | 116 | 8·5 |
| | | | | | | | | Centre | 5 & 7 | 4 & 8 | 3 & 9 | 2 & 10 | 1 & 11 | | | |
| 150 0 | 12·50 | a/10 | 20·50 | 18 × 15 | 6·00 | 51·25 | 66·25 | 3·00 | 3·83 | 5·49 | 8·00 | 11·33 | 15·50 | 98,900 | 113 | 7·0 |
| ,, | ,, | a/11 | 19·14 | ,, | 6·50 | 52·64 | 70·52 | 3·00 | 3·80 | 5·35 | 7·66 | 10·73 | 14·55 | 114,270 | 115 | 7·5 |
| ,, | ,, | a/12 | 18·00 | ,, | 6·50 | 54·00 | 73·50 | 3·00 | 3·76 | 5·22 | 7·38 | 10·23 | 13·76 | 123,630 | 117 | 8·0 |
| ,, | ,, | a/13 | 17·04 | ,, | 6·50 | 55·25 | 75·35 | 3·00 | 3·74 | 5·11 | 7·13 | 9·80 | 13·09 | 132,600 | 119 | 8·0 |
| ,, | ,, | a/14 | 16·21 | ,, | 7·00 | 56·75 | 81·25 | 3·00 | 3·72 | 5·02 | 6·93 | 9·43 | 12·52 | 141,960 | 121 | 8·5 |
| ,, | ,, | a/15 | 15·50 | ,, | 7·00 | 58·20 | 84·45 | 3·00 | 3·69 | 4·94 | 6·75 | 9·11 | 11·02 | 151,320 | 123 | 8·5 |

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## SUSPENSION BRIDGE—*cont.*

*Calculated to carry Infantry in File (crowded at a check) – cont.*

| Span. | Bays. | Dip. | Height of Pier. | Size of Anchor Log. | Depth of Anchor-age. | Jk. for Cable. | Jk. for Anchor-age. | Slings. | | | | | | | Tension at H. | Length of Cable. | Size of Cable. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Centre | 7&9 | 6&10 | 5&11 | 4&12 | 3&13 | 2&14 | 1&15 | | | |
| ft. in. | ft. | | ft. | ft. in. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | ft. | lbs. | fath. | in. |
| 160 0 | 10·00 | a/10 | 21·66 | 18×15 | 6·50 | 54·15 | 70·40 | 3·00 | 3·58 | 4·66 | 6·25 | 8·33 | 10·90 | 14·00 | 17·60 | 112,320 | 118 | 7·5 |
| ,, | ,, | a/11 | 20·20 | ,, | 6·50 | 55·55 | 73·43 | ,, | 3·56 | 4·57 | 6·04 | 8·00 | 10·35 | 13·20 | 16·50 | 122,888 | 120 | 8·0 |
| ,, | ,, | a/12 | 19·00 | ,, | 6·50 | 57·00 | 78·00 | ,, | 3·54 | 4·50 | 5·88 | 7·66 | 9·87 | 12·50 | 15·54 | 131,872 | 122 | 8·0 |
| ,, | ,, | a/13 | 18·00 | ,, | 7·00 | 58·50 | 81·25 | ,, | 3·52 | 4·43 | 5·73 | 7·41 | 9·47 | 11·93 | 14·76 | 141,440 | 124 | 8·5 |
| ,, | ,, | a/14 | 17·09 | ,, | 7·00 | 59·50 | 84·00 | ,, | 3·51 | 4·37 | 5·61 | 7·19 | 9·13 | 11·43 | 14·10 | 151,524 | 126 | 8·5 |
| ,, | ,, | a/15 | 16·33 | ,, | 7·00 | 61·23 | 87·48 | ,, | 3·50 | 4·33 | 5·50 | 7·00 | 8 83 | 11·00 | 13·50 | 161,408 | 128 | 9·0 |
| | | | | | | | | Centre | 7&9 | 6&10 | 5&11 | 4&12 | 3&13 | 2&14 | 1&15 | | | |
| 170 0 | 10·625 | a/10 | 22·83 | 18×15 | 6·50 | 57·08 | 73·33 | 3·00 | 3·62 | 4·77 | 6·45 | 8·66 | 11·40 | 14·70 | 18·54 | 119,340 | 121 | 8·0 |
| ,, | ,, | a/11 | 21·28 | ,, | 6·50 | 58·52 | 76·40 | ,, | 3·61 | 4·67 | 6·23 | 8·28 | 10·80 | 13·81 | 17·36 | 129,506 | 124 | 8·0 |
| ,, | ,, | a/12 | 20·00 | ,, | 7·00 | 60·00 | 81·00 | ,, | 3·58 | 4·59 | 6·12 | 7·96 | 10·29 | 13·10 | 16·36 | 140,114 | 128 | 8·5 |
| ,, | ,, | a/13 | 19·00 | ,, | 7·00 | 61·43 | 84·20 | ,, | 3·56 | 4·53 | 5·90 | 7·69 | 9·87 | 12·48 | 15·53 | 150,280 | 130 | 8·5 |
| ,, | ,, | a/14 | 18·00 | ,, | 7·00 | 63·00 | 87·50 | ,, | 3·54 | 4·48 | 5·77 | 7·46 | 9·51 | 11·95 | 14·81 | 160,888 | 132 | 9·0 |
| ,, | ,, | a/15 | 17·16 | ,, | 7·50 | 64·35 | 91·50 | ,, | 3·53 | 4·42 | 5·66 | 7·25 | 9·19 | 11·50 | 14·18 | 171,496 | 135 | 9·0 |
| | | | | | | | | Centre | 8&10 | 7&11 | 6&12 | 5&13 | 4&14 | 3&15 | 2&16 | 1&17 | | | |
| 180 0 | 10·00 | a/10 | 24·00 | 18×15 | 6·50 | 60·00 | 76·25 | 3·00 | 3·55 | 4·55 | 6·00 | 7·88 | 10·22 | 13·00 | 16·22 | 19·88 | 126,360 | 129 | 8·0 |
| ,, | ,, | a/11 | 22·36 | ,, | 7·00 | 61·50 | 80·75 | ,, | 3·53 | 4·46 | 5·82 | 7·65 | 9·71 | 12·27 | 15·22 | 18·60 | 137,124 | 131 | 8·5 |
| ,, | ,, | a/12 | 21·00 | ,, | 7·00 | 63·00 | 84·00 | ,, | 3·52 | 4·40 | 5·66 | 7·30 | 9·29 | 11·66 | 14·40 | 17·51 | 148,356 | 134 | 8·5 |
| ,, | ,, | a/13 | 19 85 | ,, | 7·00 | 65·50 | 88·25 | ,, | 3·50 | 4·34 | 5·54 | 7·06 | 8·93 | 11·16 | 13·71 | 16·61 | 159,120 | 136 | 9·0 |
| ,, | ,, | a/14 | 18·86 | ,, | 7·50 | 66·00 | 92·25 | ,, | 3·49 | 4·29 | 5·43 | 6·88 | 8·63 | 10·71 | 13·10 | 15·82 | 170,352 | 138 | 9·0 |
| ,, | ,, | a/15 | 18·00 | ,, | 7·50 | 67·50 | 95·63 | ,, | 3·48 | 4·25 | 5·33 | 6·70 | 8·36 | 10·33 | 12·60 | 15·14 | 181,544 | 140 | 9·5 |
| | | | | | | | | Centre | 9&11 | 8&12 | 7&13 | 6&14 | 5&15 | 4&16 | 3&17 | 2&18 | 1&19 | | | |
| 190 0 | 9·50 | a/10 | 25·16 | 18×15 | 6·50 | 62·90 | 79·15 | 3·00 | 3·51 | 4·39 | 5·66 | 7·30 | 9·33 | 11·74 | 14·52 | 17·70 | 21·23 | 133,380 | 132 | 8·0 |
| ,, | ,, | a/11 | 23·43 | ,, | 7·00 | 64·41 | 83·66 | ,, | 3·49 | 4·32 | 5·51 | 7·04 | 8·90 | 11·11 | 13·68 | 16·60 | 19·83 | 144,742 | 137 | 8·5 |
| ,, | ,, | a/12 | 22·00 | ,, | 7·00 | 66·00 | 87·00 | ,, | 3·47 | 4·27 | 5·37 | 6·81 | 8·53 | 10·60 | 12·96 | 15·67 | 18·67 | 156,958 | 139 | 9·0 |
| ,, | ,, | a/13 | 20·78 | ,, | 7·50 | 67·54 | 91·91 | ,, | 3·47 | 4·22 | 5·26 | 6·60 | 8·23 | 10·13 | 12·35 | 14·88 | 17·68 | 167,960 | 142 | 9·0 |
| ,, | ,, | a/14 | 19·73 | ,, | 7·50 | 69·06 | 95·31 | ,, | 3·45 | 4·18 | 5·16 | 6·43 | 7·86 | 9·78 | 11·86 | 14·21 | 16·85 | 179,816 | 145 | 9·5 |
| ,, | ,, | a/15 | 18·83 | ,, | 8·00 | 70·61 | 100·61 | ,, | 3·45 | 4·16 | 5·09 | 6·30 | 7·75 | 9·46 | 11·43 | 13·64 | 16·11 | 191,672 | 148 | 10·0 |
| | | | | | | | | Centre | 9&11 | 8&12 | 7&13 | 6&14 | 5&15 | 4&16 | 3&17 | 2&18 | 1&19 | | | |
| 200 0 | 10·00 | a/10 | 26·33 | 18×15 | 7·00 | 65·83 | 83·33 | 3·00 | 3·53 | 4·46 | 5·80 | 7·53 | 9·66 | 12·20 | 15·13 | 18·46 | 22·20 | 140,400 | 142 | 8·5 |
| ,, | ,, | a/11 | 24·51 | ,, | 7·00 | 67·40 | 86·70 | ,, | 3·51 | 4·38 | 5·64 | 7·25 | 9·20 | 11·54 | 14·23 | 17·30 | 20·72 | 152,360 | 144 | 8·5 |
| ,, | ,, | a/12 | 23·00 | ,, | 7·50 | 69·00 | 91·50 | ,, | 3·49 | 4·36 | 5·50 | 7·01 | 8·82 | 11·00 | 13·50 | 16·33 | 19·50 | 164,840 | 146 | 9·0 |
| ,, | ,, | a/13 | 21·72 | ,, | 7·50 | 70·60 | 94·97 | ,, | 3·49 | 4·28 | 5·38 | 6·79 | 8·50 | 10·54 | 12·87 | 15·50 | 18·46 | 176,800 | 148 | 9·5 |
| ,, | ,, | a/14 | 20·62 | ,, | 8·00 | 72·17 | 100·17 | ,, | 3·47 | 4·24 | 5·28 | 6·61 | 8·22 | 10·14 | 12·33 | 14·80 | 17·58 | 189,280 | 151 | 10·0 |
| ,, | ,, | a/15 | 29·66 | ,, | 8·00 | 73·73 | 103·73 | ,, | 3·47 | 4·20 | 5·20 | 6·47 | 8·00 | 9·80 | 11·87 | 14·20 | 16·80 | 201,760 | 153 | 10·0 |

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## *BRAKESMAN BRIDGE.*

*By* LT.-COL. G. F. WILKINSON, *Director of Engineers, Australia.*

THE accompanying plate and drill detail demonstrate the use of R.E. tool carts for light bridging purposes.

A bridge as described was constructed by Lieut. C. J. H. Keeley during the training of Engineer reinforcements at Seymour, Victoria. It was put together on dry ground and pulled into position by a team of six horses across a river of an average depth of 4 ft. 6 in. It was used for the passage of infantry.

### GENERAL PRINCIPLES.

The bridge will be formed by the brakesmen of the double tool carts and the G.S. waggons of Engineer Companies.

*Stores.*—Baulks, 5 ft. × 3 ft., 18, 21 ft. in length.
Chesses, ordinary R.E.
Lashings, 1½ 4—6 fathoms.

*Prepare to Form Bridge.*—Tool carts are lined up in column of route, full interval.

*Prepare to Dismount.*—Dismount, unhook.
Brakesmen of tool carts dismount on off sides of tool carts.
Brakesmen of waggons on off and near sides respectively.

*Unload Stores.*—Brakesmen of tool carts disengage iron section of tool carts and run back same about 18 ft. G.S. waggon brakesmen unload stores, the near side man doubles round and covers off side man. Baulks are unloaded from off side of waggon and placed on off side of tool carts, near side stores on near side, chesses are placed three to each bay on near side. Two spare men detailed as gear men place the lashings for baulks, poles, and chesses, in their respective positions.

*Form Bridge.*—Poles of rear cart are extended to full length. Baulks are placed in position on top of tool carts, which are held horizontal to the ground to facilitate the lashing securely of the baulks to either side guard rail.

The poles are lashed up taut with a V-shaped lashing to the baulks, which is done by the spare men (or men who are providing the lashings).

*Anchors.*—Three or six men where necessary are detailed to make anchors from crossed pick heads and helves to which they attach the cable.

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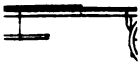

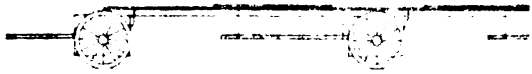

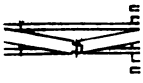

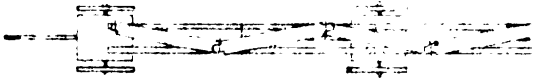

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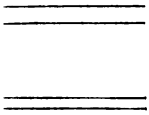

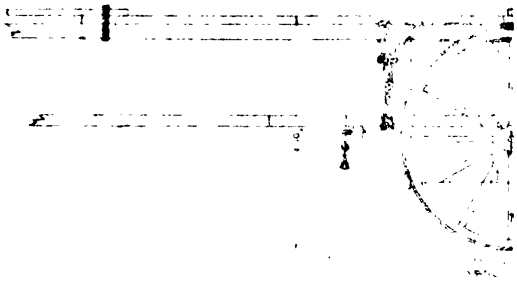

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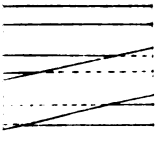

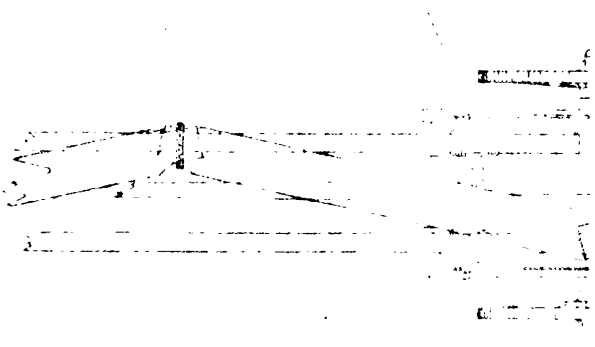

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*Provision for Entry to and Exit from the Bridge* is made by extra baulks, chesses, and lashings being placed on front bay of bridge before mounting drivers; rear approach laid on bank of river.

*Prepare to Mount.*—Teams are hooked into front carts. Drivers and brakesmen prepare to mount in the usual manner, anchor men mount in the centre of bridge and coil up ready for casting anchor.

*Walk March.*—The site being selected beforehand team drivers will follow No. 1 to selected position, when in position the command "Halt" will be given.

*Anchors.*—Spare men will cast anchors and will temporarily belay.

*Unhook.*—Leading brakesmen will release traces of wheel horses and allow horse team to get clear.

*Shore Bays.*—The two front brakesmen will push out the landing bay and lash. The two rear brakesmen will push out rear bay for entry to bridge and lash same.

*Make Fast.*—Belay, anchor men will belay cables and brakesmen will make fast all lashings, and screw brakes down tight.

DRILL DETAIL.

*Brakesmen Dismount.*

*Unlimber.*—Brakesmen of front and rear carts unlimber and run rear cart back 18 ft. No. 1 takes hold of pole. No. 2 takes out rear pin and fixes front pin in when pole is extended.

*Baulks.*—Brakesmen take baulks and place them on carts with 18-in. bearings.

*Lashings.*—Nos. 1 of each sub-section lift pole, Nos. 2 make V-lashing. The two lashing men deal with spare bays.

*Lash Bearers.*—On rear sections of carts commence with a clove hitch standing part inside V stay of rail, make a figure of eight lashing around baulk and guard rail and finish off with a clove hitch.

*Pole.*—Bight of double rope through hole of pin of front cart back to pole and thence to baulks finished with a round turn and two half hitches back to pole and finish off.

*Front of Cart.*—Commence with a magnus hitch on bearer, then to stay of rail and continue round baulk down to top support of carriage front, finish off on the standing parts with half hitches.

*Chesses.*—These are placed diagonally across bearers connected with timber, hitch and four turns, and finished on road bearer with clove hitch.

This bridge has been run across a river by a team of six horses (medium draught) and been built in seven minutes by partially trained men. The bearers are lashed in such a way that the bridge can be completely turned around in its own length. In deep water it has been floated by filling the lower well of tool carts with kerosene tins. A deep river can be spanned by fixing a line to pole of front tool cart connecting same through a pulley block on the far side and attaching horses to pull same on the shore side.

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# *MEASURES FOR REINFORCING THE SUPPLY, PRESENT AND FUTURE, OF OFFICERS FOR THE SCIENTIFIC SERVICES OF THE ARMY AND NAVY, INCLUDING THE IMPERIAL AIR SERVICES.*

*By* COLONEL B. R. WARD, R.E., C.M.G., MEMB. AER. INST.

A MEETING called by the Aeronautical Institute was held in the Institute's Rooms on March 22nd. Sir William Cospatrick Dunbar, Bart., C.B., was in the chair. The meeting was convened for the reading of a Paper by Colonel B. R. Ward on the problem of permanently securing the best and most abundant supply of officers for the Scientific Services of our Imperial Fighting Forces. The Paper (a summary of which by the courtesy of the Editor of *Air*, the official organ of The Aeronautical Institute of Great Britain) was read in the absence of the author, who had telegraphed his regrets at being unable to be present, at the same time expressing his desire to associate himself with any Committee of the Institute which might be formed to promote the objects outlined in the Paper.

The Author set forth:—

1. The fundamental idea put forward consists in the conception that the Scientific Services of our fighting forces can preserve the highest standard of efficiency, prestige and personnel only by maintaining direct contact with the great professional engineering organizations of civilian life, and by maintaining practical connection with the vast and varied engineering and scientific work of civilian national life

2. The verdict of history shows that, if divorced from the whole body of engineering practice and experience in general, the Scientific Services must inevitably become atrophied, and decline in power.

3. A case in point is furnished by the history of the Corps of United States Engineers, previous to the Panama Canal undertaking.

Only quite recently the prestige of the Corps had fallen to a very low ebb. More than six years ago, however, the officers of the Corps were placed in charge of the Panama Canal Works, undoubtedly the biggest engineering job that has ever been tackled by a corps of military engineers. Their prestige at the present moment, therefore, is distinctly high in the American Army; but it rests on the execution of a civil engineering work.

Years ago, before the American Civil War, 1861—1865, the prestige

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of the Corps of the U.S.E. was very high indeed. The officers of the Corps were employed in several branches of civil engineering, and the head boy of the West Mount Military Academy almost invariably joined the Corps of Engineers on completing the four-year course.

On the outbreak of the Civil War, all engineering officers were taken for field service.

The Corps consisted of about 150 officers, and the proportion of distinguished generals drawn from this body was very great. At the end of the War all the engineering jobs of these officers were being run by civilians; and when the U.S. Army was re-organized after the War, the Corps of Engineers was unable to get back more than a very small portion of the civilian engineering work that they had previously done. In addition to their work of barrack and fort construction and repair, they had charge of national parks and harbour works. The U.S. Military Authorities, after a time, began to think it was not necessary to retain these, as they were civilian engineering jobs. Pressure was, no doubt, being brought to bear, all the time, by civilian engineers in order that they should get control of these works. In order to retain national parks and harbour works as part of the work of the Corps, the U.S. Engineers recognized that they would have to fight for themselves, as no one else was likely to do it for them. What they did was to join the American Institute of Civil Engineers in a body; and they succeeded in getting one of their members elected President.

By this policy of agreeing with an adversary quickly whilst they were in the way with him, they undoubtedly saved themselves from practical extinction Even this policy was unable to save the Corps of Engineers from considerable lowering of prestige as compared with its former high position before the War, and had it not been for the execution of the Panama Canal, more drastic measures would probably have been necessary in order to keep the Corps of United States Engineers as a body of real value to the country.

4. Obviously an Engineer Corps whose officers are not highly qualified engineers must eventually recruit a lower type of *personnel* than would be the case if they were men of recognized standing in their profession.

5. Our Royal Army Medical Corps offers a parallel example to the history of the United States Engineers, and shows how the backing of the civil profession is necessary for a military technical body to obtain its proper status and high efficiency in the Army.

Medical Officers used to be attached to Regiments, and were under Commanding Officers of Regiments and Battalions. They had no strong central organization of their own, and their interests were liable to be lost sight of, or pushed on one side, by the higher military authorities. It was not until the civil medical profession as a body demanded army rank, that the centrally-organized Army

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Medical Corps, the R.A.M.C. as we now know it, succeeded in attaining its present high position and prestige.

6. In 1907, the Military authorities in Canada, influenced by such considerations as outlined in Par. 3, approved a scheme for interesting, practically, the engineering students of various Canadian Universities in the military side of the engineering profession.

7. Undoubtedly without the support of the civilian engineering professions, it would be very difficult for our Corps of Royal Engineers to retain in the twentieth century the prestige which it had gained during the nineteenth. That prestige is due to certain special circumstances. First and foremost, perhaps, is the fact of the expansion of the Empire during that period. This expansion gave scope to engineering officers and companies to develop colonies whilst in an embryonic condition, and gave them opportunities which, owing to the high developments in the dominions beyond the seas, are now entirely closed to them.

8. The absolute necessity for having men of high standing and honour in a corps like the R.E. will be appreciated when it is considered that the responsibility for the expenditure of enormous sums of money falls upon them continually.

9. Looking at the whole question from the wider national point of view, and with the experience of the last two and a-half years of war, it is now more evident than ever that the country can never put forth its full strength unless and until all civilian engineers (including Mechanical, Electrical, Aeronautical, Automobile, Railway, Mining, Constructional Engineers, etc.) are definitely organized in connection with the various corps of the fighting services, whose work is of an engineering nature. War now is a war of engineers, ironworkers and chemists to a degree never dreamt of before.

10. The practical thing, therefore, is to organize the civilian engineering profession in such a manner that, whenever war breaks out, every engineer will know in what branch of the Army, Navy or Flying Services his work will be required.

11. This result can probably be best attained by arranging that young civilian engineers should be attached to military units for occasional courses, and that young officers of the Royal Engineers, the Flying Services, etc., should be attached to Engineering Establishments, Railways, Aeronautical Works, etc.

12. With this end in view the author approached the Institution of Civil Engineers, between whom and the Corps of Royal Engineers an arrangement already existed whereby the latter body is supplied—under control of the War Office—with Special Reserve Officers. It is satisfactory to be able to state that Mr. C. L. Morgan, of the London, Brighton and South Coast Railway, and Capt. Sankey (late Royal Engineers) have brought the whole matter to the notice of the Council of the Institution of Civil Engineers, and a

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small Committee is to be formed with authority to approach the Army Council with a view to establishing closer relations, on certain definite lines, between the Institution of Civil Engineers and Royal Engineers.

13. The author has urged similar action on the part of the Institution of Mining and Metallurgy and the Royal Institute of British Architects, for the supply of constructional engineers to the Corps of Royal Engineers. A further suggestion embodied the idea that these Institutions should subsequently set up a central co-ordinating Committee among themselves, to handle the whole matter in the most simplified form, and to co-operate most helpfully with the War Office.

14. In order to pursue the subject to its conclusion, the author proposes that the Institutions of Mechanical Engineers, Electrical Engineers, Automobile Engineers, the Aeronautical Institute with other organizations capable of dealing with the training and employment of Mechanical Engineers in civil life should—first separately and then in combination—organize a system for feeding a proposed Corps of Mechanical Engineers for the benefit of the Army, Navy, and Flying Services.

15. The author suggests that this proposed Corps of Mechanical Engineers may be most efficiently co-ordinated under the present Ministry of Munitions, which, in most essential respects, is the lineal successor of the old Board of Ordnance. The new Ministry of Munitions seems to be the best organization to give to the newer scientific Services of the Army, Navy, and Air Organizations the same kind of assistance which the old Board of Ordnance gave to the older Scientific Corps: the Royal Engineers and the Royal Artillery.

16. Only by means of some such scheme as the one outlined in the Paper would the Ministry of Munitions—or some other organization of similar scope and independent authority—be able to mobilize the entire mechanical engineering strength of the country.

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## *AIRCRAFT AND MOTOR CAR ENGINE DESIGN.*

*By* MR. LOUIS COATALEN.

AT a period when the management and equipment of our aircraft services is attracting public attention throughout the length and breadth of the land, as well as in the theatres of war in which British arms are engaged, more than ordinary interest attaches to the paper of Mr. Louis Coatalen, delivered to the members of the Aeronautical Society of Great Britain on the above subject, in that he stands in the unique position of being a signally successful designer and constructor of both types of engines, besides being the only motor car manufacturer in these islands who had ready and standardized at the time war broke out more than one model of aircraft engine of original design and of sufficient power to be of use for the needs of our air services during the War, in the course of which he has also evolved, at the request of the authorities, a wider variety of practical standardized models than any constructor in this or any other country.

Mr. Coatalen opened by saying that our national habit of decrying our own achievements and praising that of foreigners, notably the Germans, was never more in evidence than in the case of the aircraft engine problem ; nor was it ever less justified. The case of the latest 6-cylinder Mercedes engine to be captured by the Allies might be taken by way of illustration. Without water and radiator it weighed $3\frac{1}{2}$ lbs. per horse-power ; whereas the latest British water-cooled aircraft engine in the same condition weighed 1 lb. less per horse-power. As regards efficiency, he claimed that this country had produced engines that were out and away superior to anything which our enemies had employed in the campaign to date. He pointed out that the belief which appears to obtain in some quarters to the effect that the design and production of an aircraft engine is akin to that of a motor car one is erroneous. Flexibility, silence, and cost of production are governing factors in designing a motor car engine ; they are practically of no consequence in the case of an aircraft one. On the other hand, weight, a very high brake mean effective pressure, the capability to work at full power for long periods, and comparative great horse-power output—reckoned in terms of hundreds instead of tens—are of prime importance in aircraft engine construction and of comparative unimportance in motor car engine design and production. On this, and sundry other grounds the lecturer detailed.

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the design of the two types must start from fundamentally opposite points of view.

The aircraft engine proposition calls, notably, for the exploitation of new methods of achieving lubrication, in that the system that suffices for a car proves inefficient for aircraft engines of high output, which are alone useful in warfare to-day. The lubricant becomes too hot, therefore too fluid, resulting in the reduction of pressure to the main bearings, hence the evolution of the dry sump system for lubricating aircraft engines.

" We must not lose sight of the likelihood that the rapid evolution of the aircraft engine during this war and the extraordinarily wide manufacturing experience which is the outcome of that, will at some future time exercise more than a temporary effect on the design and manufacture of engines for car service," he said. He held that there was a closer analogy between the motor car engine designed and built specially for racing before the War and the wartime aircraft engine, than there was between either that type of car engine and the standardized car motor, or, again, the standardized car motor and the aircraft engine of to-day. For instance, the racing car engine resembles the latest aviation types in that a very high mean effective pressure has to be obtained with it. As the problem in both cases is power for weight and engine volume, and not silence and low cost, great freedom is allowed the designer of a racing car engine as regards piston clearances, valve timing, compression, largeness of valve area, strength of valve springs and so forth, the particulars in this connection approximating much more to aviation than to standard car practice.

The chief desiderata in designing aircraft engines are light weight combined with low fuel and oil consumption per horse-power ; also with reliability. Minor desiderata, which have already been largely realized, embrace simplification to the utmost in face of aircraft engines being placed, for the most part, in the hands of semi-skilled talent whether as regards actually using or merely maintaining them. Hence the demand for that quality which is generally called " fool proof " ; for accessibility, particularly in face of the fortunes of war rendering it necessary on occasions to replace the most vital parts ; and suitability of exterior form that the power plant may be accommodated conveniently in the aircraft and occasion the minimum displacement.

For the first time in the story of motor engineering we are making aircraft engines of high output in series instead of some half-a-dozen examples at a time.

There are strict limits to the sizes which are practicable for radial engines, whether of the rotary or stationary types. In regard to either vertical or V-type engines, the nature of the particular service to which each individual machine is to be put likewise imposes

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certain limits on design. Sometimes this may concern the overall length of the engine, particularly when in waging war in the air it is essential to lose the minimum time in altering the attitude of the machine from a diving position to a very steep climbing one. Again, some series of air craft call for the minimum head resistance but are less imperative as to overall length. Hence six cylinder types would be suitable for such service, whereas V-shaped varieties might not be.

At this period it is impossible to lay down any arbitrary rules as to any one type of aircraft engine being suitable for the needs of all aircraft service. Those needs are almost as various as are the demands for special varieties of steel and alloys. Moreover, they are likely to multiply with the lapse of time. Aircraft engine design resembles motor car engine production in this particular, that it is all the time a question of compromise. The most successful designer is he who exercises the soundest judgment in weighing a hundred and one factors of the hour and who makes the shrewdest estimate of the value of each.

Continuing, Mr. Coatalen said that in the circumstances of being in mid-campaign it was not possible to state definitely the size of aircraft engine which would most likely be adopted as standard in the near future. Experience gained by our aviators at the beginning of the War, together with the demands for the engineer to meet their ever-growing needs, have called for continuous evolution in the design of aircraft, which has inspired corresponding enterprise in regard to engine construction and production.

For short flights the rotary type of engine generally, and the air-cooled varieties, have shown up to advantage to date, though with them the consumption of fuel and lubricating oil may be comparatively high; this is offset by the relative lightness of their starting weight. But for longer flights, in connection with which petrol and oil consumption have to be reckoned with as part of the engine weight, water-cooled stationary type engines have proved most suitable.

Speaking broadly, as regards weight per horse-power, progress in the design of the ordinary water-cooled type of aircraft engine has been very marked. In the brief period of two years Sunbeam-Coatalen aircraft engines of this type have been reduced in weight from 4·3 lbs. per horse-power to 2·6 lbs. per horse-power. The design of the engine head, cylinders, the valves and the valve gear is one of the cardinal features of successful aircraft engine production. For water-cooled aircraft engines Mr. Coatalen favours two overhead exhaust and two overhead inlet valves per cylinder, a conclusion which would appear to be justified by the horse-power obtained from engines designed and standardized on this principle. Incidentally, it allows of the best sparking plug position, namely, in the centre of the cylinder head in the vertical position. Three valves per cylinder, namely, one inlet and two exhaust valves, have been

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found practicable for certain varieties of work. He holds that more than four valves per cylinder is an undesirable scheme as it seems hardly possible to place them so as to leave an even jacket all round each valve without the employment of very complicated gear. We have an example of this in the Maybach (German) aircraft engine which has three exhaust and two inlet valves per cylinder. In this little water space is provided between the valve seats, while the sparking plug is, besides, set horizontally on the side of the cylinder barrel.

Not only has there been much improvement in cast iron available for cylinders; aluminium alloys employed with knowledge and skill for that purpose have been found, besides, of great advantage, of course, reducing weight per horse-power to an extraordinary extent. Though we are merely on the threshold of realising the possibilities of aluminium alloys for cylinder castings, it cannot be doubted that within a very brief period they will be recognized as the standard materials for this work, cast iron thenceforward being discarded in favour of them. For two years Mr. Coatalen has standardized aluminium alloy pistons with excellent results.

It is to note, further, that air-cooling is coming into favour increasingly. The introduction of aluminium alloy in the manufacture of the cylinders has exercised a marked effect in regard to this tendency. In the near future air-cooled engines of greater power may be expected to materialize. Tests on Sunbeam-Coatalen aircraft engines have shown the petrol consumption of ·52 pints per horse-power per hour and the oil consumption of ·22 pints per horse-power per hour, representing a distinct advantage in consumption by engines using ordinary type carburettors so recently as at the beginning of the War. Nevertheless, there is room for a deal of improvement yet. Whereas at the beginning of the War the maximum mean effective pressure was 106·135 lbs., to-day it has been increased to 134 lbs. per square inch measured from the brake horse-power and, in some cases, actually through the reduction gear. In regard to methods of engine rating, Mr. Coatalen wishes to propose that the horse-power per unit capacity obtained from any given engine should be taken as the standard for preparing the different "duties" of aircraft engines. The capacity taken would be the capacity per cylinder multiplied by the number of cylinders, and by the number of complete cycles per minute. To serve the aim in view, the horse-power per litre engine capacity per thousand cycles, otherwise per two thousand crankshaft revolutions per minute, is proposed.

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## *HYDROLOGY OF THE ISTHMUS OF PANAMA.*

*By* BRIG.-GENERAL HENRY L. ABBOT, *United States Army, Retired.*

THE following paper kindly forwarded to us by General Abbot, late Corps of Engineers, U.S.A., was recently read before the National Academy of Science.

The Panama Canal being now opened to traffic, there remains for study only one important hydraulic problem—the sufficiency of the available water supply to meet the needs for lockage, for mechanical power to operate the canal and railroad, and for the electric lighting of the Canal Zone. It should not be forgotten, however, that if a larger volume of water be desirable for these and other uses, the plan proposed by the New French Company to supplement the volume of its smaller projected lake is still available; namely, the construction of a masonry dam near Alhajuela, where a good site exists for creating an upper lake to hold back the surplus water which during the rainy months now runs to waste through the spillway.

The Canal Zone lies between the ninth and tenth degrees of north latitude in a region of exceptional rainfall; where the sun, closely followed by rain clouds raised from the oceans in his annual journey between the tropics, exerts a controlling influence upon the volume of local rainfall. When near his southern limit, in January, February, March and April, precipitation upon the Isthmus is at its minimum; December and May are usually intermediate in volume; in the remaining six months, when near his northern limit, heavy downpours are the rule. Furthermore, the local annual rainfall is not uniform across the Isthmus. As one passes from the Atlantic to the Pacific coast, the volume falls off gradually from about 130 inches at Colon to about 70 inches at Panama. It will be noticed that even the latter is more than double the usual downfall in the United States, a fortunate circumstance for our great artery of commerce. Another local advantage is the fact that the atmosphere of the Isthmus is nearly saturated with aqueous vapour, which largely reduces the losses by lake evaporation. Our hydraulic problem seems therefore to be specially concerned with Isthmian rainfall and outflow, and the relation between them.

To determine accurately the average annual rainfall at any locality, the records should cover at least half a century. Although the Isthmus has been known to civilization for more than 400 years, the first annual rainfall records date from 1863, when they were begun

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by the agents of the Panama Railroad Company. As to the outflow from the watershed, the records are even less complete. The volume received from the clouds, after reduction by evaporation, by plant growth, and by possible infiltration, represents the available flow at the dam site. To determine to what extent existing data throw light upon this quantity, has seemed to me to be of primary interest.

The earlier records are given in a paper published in the *Monthly Weather Review* in May, 1899; they include those of the Railroad company, and those at that date collected by the two French Companies and the Liquidation. A gap of a few years in the former is supplied by a paper by Mr. A. P. Davis, published in the Twenty-second Annual Report of the United States Geological Survey for 1900–1901. These data are supplemented and discussed by the writer in papers published in the *Monthly Weather Review* of February, 1904, and of June, 1908, together with some later data collected by the American engineers. In March, 1913, Mr. Caleb M. Saville contributed a valuable paper upon the Hydrology of the Canal to the transactions of the American Society of Civil Engineers, bringing the records up to 1910. The Annual Reports of the Isthmian Canal Commission, of course, cover the American operations. The first point for consideration is, how these data can best be grouped for study?

The narrow limits to which the earlier observations were restricted suggest that the basin of the Chagres River above Bohio should be adopted until Gatun Lake began to fill early in 1910. Its area has been accurately determined by recent surveys to be 779 square miles. The early rain records were mostly restricted to Colon and Gamboa. Fortunately, Colon is situated near the Atlantic Coast line where the rainfall is largest, and Gamboa well represents the Pacific limit of the watershed. A careful analysis of the more ample records of recent years (1898—1907) has shown that the average rainfall in the basin above Bohio is about 89 per cent. of that at Colon, 124 per cent. of that at Gamboa, and 52 per cent. of the aggregate of the two stations. To avoid a change in the standard, these ratios have been used throughout the following table to estimate the annual rainfall in the basin; and where a few dry months are missing in the early railroad records the vacancies have been supplied by the mean values of the missing months.

The Chagres River is a torrential stream, and the first French Company early established a fluviograph at Gamboa to register continuously the heights of the water. This record has been carefully kept since 1883; until the rise of the lake in 1910 began to affect the local water level. At the times of freshets the oscillations are so sudden that their number and duration are readily noted, and they furnish valuable checks upon the discharge estimates.

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For this study they are assumed to begin and end at a stage 10 ft. above low water, which is rarely exceeded.

Accurate measurements of discharge were inaugurated by the Liquidation and the New French Company, the continuous record dating from 1890. The annual outflow is given in the tables under the forms of cubic feet per second and depth in inches upon the watershed; the latter to permit a direct comparison with the rainfall. Years of great floods are also indicated, with the same object in view.

The first table is intended to present, for the basin above Bohio, all available hydraulic data prior to the date when Gatun Lake began to fill, with some later figures added for comparison with those of the second table, which includes the entire watershed above Lake Gatun during the filling of the lake. In future studies this latter basin will doubtless be adopted, as the net outflow is easily determined and rainfall measurements are now made at many stations. For the second table I first adopted the mean of the rainfall records at nine stations—Colon, Gatun, Trinidad, Camacho, Empire, Culebra, Gamboa, Alhajuela and El Vigia—as well representing the average volume falling upon the lake watershed near the Canal Zone. Seven new stations then unknown to me had been added, and the figures now given are taken from the noteworthy paper by Mr. Willson in the *Transactions of the International Engineering Congress at San Francisco.*

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HYDROLOGY OF THE WATERSHED ABOVE BOHIO; 779 SQUARE MILES.

| Year. | PRECIPITATION. Colon, Inches. | Gamboa, Inches. | IN THE BASIN ABOVE BOHIO. Rainfall, Inches. | Outflow. Ft.-sec. | Inches. | GAMBOA FRESHETS. Annual No. | Duration, Hours. | Authority. |
|---|---|---|---|---|---|---|---|---|
| 1863 | 134·3 | | 120 | | | | | Panama Railroad Records. |
| 1864 | 123·4 | | 110 | | | | | |
| 1865 | 107·4 | | 96 | | | | | |
| 1866 | 129·7 | | 115 | | | | | |
| 1867 | 120·8 | | 108 | | | | | |
| 1868 | 120·0 | | 107 | | | | | |
| 1869 | 114·8 | | 102 | | | | | |
| 1870 | 149·6 | | 133 | | | | | |
| 1871 | 99·6 | | 81 | | | | | |
| 1872 | 168·5 | | 150 | | | | | |
| 1873 | 87·1 | | 78 | | | | | |
| 1874 | 137·7 | | 123 | | | | | |
| 1875 | 94·7 | | 84 | | | | | |
| 1876 | 124·5 | | 111 | | | | | |
| 1877 | 115·5 | | 103 | | | | | |
| 1878 | 86·7 | | 77 | | | | | |
| *1879 | 164·2 | | 130 | | | | | |
| 1880 | 136·4 | | 121 | | | | | |
| 1881 | 102·3 | 89·5 | 100 | | | | | de Lesseps French Cie. |
| 1882 | 124·1 | 79·6 | 106 | | | | | |
| 1883 | 115·3 | 76·6 | 100 | | | 21 | 201 | |
| 1884 | 86·5 | 95·9 | 95 | | | 25 | 334 | |
| *1885 | 146·3 | 97·5 | 127 | | | 37 | 437 | |
| 1886 | 137·2 | 102·9 | 125 | | | 43 | 437 | |
| 1887 | 154·9 | 136·2 | 151 | | | 46 | 709 | |
| *1888 | | 102·6 | 127 | | | 29 | 596 | |
| 1889 | | 75·7 | | | | | | Collapse. Liquidation. |
| *1890 | 154·3 | 105·0 | 135 | 6,304 | 110·0 | 34 | 308 | |
| 1891 | 124·7 | 77·7 | 105 | 4,476 | 78·1 | 10 | 115 | |
| 1892 | 145·3 | 104·4 | 130 | 6,513 | 113·6 | 24 | 269 | |
| *1893 | 131·9 | 117·8 | 130 | 7,081 | 123·3 | 12 | 220 | |
| 1894 | 153·7 | 90·6 | 127 | 6,098 | 106·4 | 25 | 263 | |
| 1895 | 151·5 | | 135 | 4,482 | 78·2 | 7 | 54 | The New French Cie. |
| 1896 | 131·5 | | 117 | 4,216 | 73·5 | | | |
| 1897 | 138·0 | 107·8 | 128 | 4,830 | 84·2 | 16 | 157 | |
| 1898 | 115·5 | 82·6 | 103 | 3,944 | 68·8 | 8 | 51 | |
| 1899 | 133·0 | 80·0 | 111 | 3,384 | 59·0 | 8 | 57 | |
| 1900 | 116·1 | 78·7 | 101 | 3,509 | 61·2 | 12 | 84 | |
| 1901 | 107·7 | 91·6 | 104 | 3,855 | 67·2 | 13 | 107 | |
| 1902 | 112·6 | 97·7 | 109 | 4,179 | 72·9 | 5 | 37 | |
| 1903 | 126·3 | 99·3 | 117 | 3,958 | 69.0 | 12 | 94 | |
| 1904 | 126·9 | 84·5 | 110 | 4,110 | 71·7 | 13 | 94 | U.S. in charge. |
| 1905 | 115·4 | 82·2 | 103 | 2,800 | 48·8 | 6 | 48 | |
| *1906 | 138·1 | 97·8 | 123 | 4,169 | 72·7 | 12 | 178 | |
| 1907 | 125·6 | 78·1 | 106 | 3,597 | 62·7 | 11 | 69 | |
| 1908 | 137·7 | 77·5 | 112 | 3,732 | 65·1 | 14 | 131 | |
| *1909 | 183·4 | 122·1 | 159 | 7,335 | 128·0 | 27 | 466 | |
| 1910 | 150·0 | 116·0 | 138 | 6,340 | 110·6 | 15 | 77 | Lake began to fill. |
| 1911 | 112·8 | 70·6 | 95 | | | | | |
| 1912 | 117·6 | 89·1 | 107 | | | | | |
| 1913 | 131·2 | 86·3 | 113 | | | | | |
| 1914 | 132·7 | 77·4 | 109 | | | | | |

HYDROLOGY OF THE WATERSHED ABOVE LAKE GATUN; 1,320 SQUARE MILES.

| Year. | Lake Above Mean Sea Level, Feet. | IN THE LAKE WATERSHED. Rainfall, Inches. | Net Outflow. Foot-Seconds. | Inches. | Lake Evaporation, Foot-Seconds. |
|---|---|---|---|---|---|
| *1909 | 3·63 | 162·42 | 10,704 | 110·1 | |
| 1910 | 13·07 | 149·66 | 11,938 | 122·9 | |
| 1911 | 15·15 | 98·41 | 5,710 | 58·8 | |
| 1912 | 31·24 | 102·83 | 4,985 | 51·3 | |
| 1913 | 57·87 | 102·40 | 5,272 | 54·3 | 484 |
| 1914 | 85·26 | 100·54 | 5,118 | 52·7 | 704 |
| 1915 | 86·17 | 118·17 | 7,106 | 80·2 | 733 |

* Great flood of the Chagres River.

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An inspection of these tables shows a satisfactory correspondence between the observed annual rainfall and the outflow and river oscillations as indicated by the number and duration of the freshets. There is, furthermore, a suggestion of a tendency to a progressive annual change between years of maxima and minima in these quantities, which is worthy of notice. If future records confirm this suggestion, it will be needful to study the reason for it, as is now the case with sola spots, aurora borealis, and other natural phenomena. As to the second table, it must not be forgotten that it covers a period when the area of the lake was gradually increasing, causing a variable loss due to evaporation. The values given for it for the last three years are taken from the official reports, and are based probably on direct measurements.

The tropical conditions of the Canal Zone are so different from those in the Continental United States that it is interesting to compare them. This may be done from Rafter's tables, in his valuable paper published as the Water-Supply and Irrigation Paper, No. 80, of the Geological Survey. It is done in the following table :—

AVERAGE RAINFALL, RUN-OFF, AND DIFFERENCE.

| Watershed. | Area, Square Miles. | Period, Years. | Rainfall, Inches. | LOSSES. By Outflow. Inches. | Per Cent. | By Evap., Etc. Inches. | Per Cent. |
|---|---|---|---|---|---|---|---|
| Muskingum River ..... | 5,828 | 8 | 39·7 | 13·1 | 33 | 26·6 | 67 |
| Genessee River ..... | 1,070 | 9 | 40·3 | 14·2 | 35 | 26·1 | 65 |
| Croton River ..... | 339 | 23 | 49·4 | 22·8 | 46 | 26·6 | 54 |
| Lake Cochituate ..... | 19 | 38 | 47·1 | 20·3 | 43 | 26·8 | 57 |
| Sudbury River ..... | 78 | 26 | 46·1 | 22·6 | 49 | 23·5 | 51 |
| Mystic Lake ..... | 27 | 18 | 44·1 | 20·0 | 45 | 24·1 | 55 |
| Neshaming Creek ..... | 139 | 16 | 47·6 | 23·1 | 49 | 24·5 | 51 |
| Perkiomen Creek ..... | 152 | 16 | 48·0 | 23·6 | 50 | 24·4 | 50 |
| Tohickon Creek ..... | 102 | 15 | 50·1 | 28·4 | 57 | 21·7 | 43 |
| Hudson River ..... | 4,500 | 14 | 44·2 | 23·3 | 53 | 20·9 | 47 |
| Pequannock River ..... | 64 | 9 | 46·8 | 26·8 | 57 | 20·0 | 43 |
| Connecticut River ..... | 10,234 | 8 | 43·0 | 22·0 | 51 | 21·0 | 49 |
| Chagres River ..... | 779 | 21 | 118·1 | 82·1 | 69 | 36·0 | 31 |
| Gatun Lake Basin ..... | 1,320 | 6 | 119·4 | 75·0 | 63 | 28·3 | 24 |

An inspection of the last four columns will show how much more favourable to the operation of a canal are the hydraulic conditions prevailing upon the Isthmus than those existing near the Atlantic Coast of the United States. Considerably more than double the volume of rainfall is available, and the losses from evaporation, plant growth, and percolation are represented by only about 30 per cent. as against 50 per cent. of that volume. As stated above, it remains to be determined by the observations of many future years whether there is a tendency to a normal variation in annual rainfall upon the Isthmus, as seems to be suggested by the figures already on record.

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# *REVIEW.*

## THE YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY, 1917.

*The Wireless Press, Ltd.* (Marconi House, W.C.), have recently published the Fifth Annual number of *The Year Book of Wireless Telegraphy and Telephony;* the high standard of the previous issues of this useful handbook is fully maintained in the current number. Although the size of the volume has been increased to 928 pages, and the War must have increased the cost of production, nevertheless the publishers have decided not to raise the price of this volume which remains at 3s. 6d. net.

It is pointed out in the Preface that questions of public policy have affected the completeness of the reference section devoted to call letters, and other particulars relating to Land and Ship Stations. Otherwise this information has been brought up to date and is thoroughly reliable.

The Wireless Map of the World inserted in the present number has been enlarged into a duplicated Mercator, showing Australia and the Far East as reached both by the Eastern and Western routes. The volume is also provided with a series of photographic reproductions of apparatus of historical interest and with portraits of some of the prominent workers in the field of wireless telegraphy.

" The Record of the Development of Wireless Telegraphy and Telephony " with which the volume opens is brought down to 1916. Under 1916, entries record that " during the course of a severe blizzard in the United States during February wireless telegraphy was extensively used for train despatching, as the telegraph wires had been destroyed " ; that " the determination of the difference in longitude between Paris and Washington with the aid of wireless telegraphy, which had been in progress since October, 1913, was completed in May, the result expressed in terms of time, being 5 hours 17 minutes 35·67 seconds, and has a probable accuracy of the order of ·01 second " ; that " the initiation of the newly-established Trans-Pacific Wireless Service between the United States and Japan was celebrated on Wednesday, November 5th, by an interchange of messages between the Mikado and President Wilson."

Under the heading " National and International Wireless Laws and Regulations " a brief review is given of the legislative steps taken to bring about an efficient control of wireless telegraphy and in relation to the inter-communication by wireless telegraphy between stations under the control of the various Powers. Attention is called to the fact that despite the War at present raging, the " Berne Bureau " continues its distribution of information.

The texts of the International Radio-Telegraphic Convention of July, 1912, and of the International Convention on Safety of Life at Sea of January, 1914, have both been reprinted in this volume. The laws and regulations of the British dependencies and of foreign countries are included ; a number of these have been amended since the last issue of the *Year Book* and in consequence the subject matter of this section has been carefully revised and brought up to date. These laws and

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regulations are preceded by a copious index which greatly facilitates reference to the matters dealt with in them. This section of the work covers 255 pages.

An increase has taken place in the numbers of both the Land Stations and the Ship Stations; the former now occupy 62 pages of small print and the latter 141 pages of small print. The number of Land Stations shown as having a normal day range exceeding 2,000 nautical miles is now seven, *i.e.*, Sayville, N.Y. (4,500 nautical miles), Tuckerton, N.J. (4,000 nautical miles), Bolinas, Cal. (3,500 nautical miles), Glace Bay (3,215 nautical miles), S. San Francisco (2,500 nautical miles), Island of Oahu, Hawaii (one station with range of 2,500 nautical miles and another with range of 2,200 nautical miles). The stations at Iquitos and San Cristobal (Peru) have both a night range of 2,400 nautical miles. The number of Ship Stations having a night range of 1,000 nautical miles and more has increased to 64; of these three have a range as high as 1,500 nautical miles.

In an article entitled "The Fleming Valve and De Forest Audion" particulars are given relating to the very important and interesting patent action brought by the Marconi Wireless Telegraph Company of America against the De Forest Radio Telephone and Telegraph Company and Lee de Forest, before Judge Mayer and the United States District Court. The suit was in respect of an infringement of claims 1 and 37 of U.S. Letters Patent No. 803,684, for "Instrument for Converting Electric Currents into Continuous Currents," filed April 19th, 1905, and issued November 7th, 1905, to plaintiff, as assignee of John Ambrose Fleming, of London, England. There was a counter-claim by defendants on various claims in ten patents of Lee de Forest.

The case was thoroughly threshed out in Court, important witnesses being called by both sides. Judge Mayer delivered his opinion on the case in extremely lucid language; it is well worth study in the original. The learned judge points out that "whatever differences may exist between men of science in respect of the theories by which they account for the movement and action of unseen forces about which so much has been testified and argued in this case, the solution of the points of the controversy with a single exception is not difficult. This, because courts in an art of this kind, place their decisions upon things demonstrable and cannot speculate as to theories in regard to which there is not a common agreement among recognized authorities."

"In endeavouring to resist plaintiff's attack, defendants have proceeded on the theory that beginning with his present patent No. 979,275 antedating Fleming, de Forest gradually developed his first conception until finally it found practical exemplification in the two so-called three electrode Audion devices to which the plaintiff has confessed judgment. In line with this plan of defence, defendants have elaborately built up an unsteady theoretical structure and upon this have superimposed an observatory from which they can see in the mind's eye only that which they call "Audion" action. Therefore, in these circumstances, it is desirable, in order to avoid confusion, to consider first the patents in issue and then the question of infringement; for when their true value is assigned to the patents, the controversy as to the infringement will be better understood. The patents deal with those instrumentalities which, in the art, are aptly named detectors."

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Judge Mayer then dealt exhaustively with the subject of detectors, and proceeded to describe the nature of Dr. Fleming's invention. He continued: "Whether right or wrong in his theory, the result of Fleming's invention was to give the art a new, valuable and easily obtainable detector, which has gone into important commercial use. This Fleming detector is highly sensitive, quickly adjusted by an operator of even inferior skill, and only momentarily disturbed by static or strong signals. The thoroughness and earnestness of this litigation is its most significant testimonial."

. . . . . .

"In the absence of a well-accepted theory of operation which needed merely some physical embodiment and, in the absence also in the art of the physical device itself, at a time when men of great skill were constantly endeavouring to bring forth an advance in this branch of the art, the contribution of Fleming was clearly invention and is entitled to liberal interpretation and consideration, unless impeded by de Forest."

The learned judge next examines de Forest's patents and skilfully explains the differences between de Forest's invention and that of Dr. Fleming. He summarizes the situation in the following words:— "Within the limits of an opinion it is, of course, impossible to analyze at length a mass of experiments, tests and theses and an infinity of detail necessarily involved in the testimony of experts in an art of this kind; but, if plaintiff's theory that his own device and that of defendants operate on the same principle has not been proved (and I think it has as far as such proof is yet possible), at least defendant's theory has not been satisfactorily demonstrated, and finally, the physical facts all support plaintiff's claim."

The learned judge declared his opinion to be that "the broad Claim No. 1 of the Fleming patent is infringed."

In conclusion, he stated "De Forest in his three-electrode Audion has undoubtedly made a contribution of great value to the art and, by the confession of judgment thereof, defendant company may enjoy the just results of this contribution; but, on the other hand, Fleming's invention was likewise a contribution of value and is to be treated liberally and not defeated either by unconfirmed theory or by association in apparatus where later developments have taught how other useful adjuncts can be employed."

Under the heading "Heroic Wireless Operators" are recorded the achievements of ships' telegraphists who performed their duty in the face of extreme peril. The portraits of six wireless men who have won official recognition are published in the volume. It is recognized by the publishers that "it is always invidious to make *any* selection where all are meritorious: it is especially so when one attempts to make selections amongst those who have 'quitted themselves like men' in the dark hours of danger."

A leading feature of the *Year Book* from its earliest days has been the series of articles on scientific and other subjects contributed by distinguished and prominent workers in the field of wireless telegraphy and telephony. A number of such articles appear in the volume under review. The first of them by Dr. J. A. Fleming, F.R.S., treats of "The Electric Arc as a Generator of Persistent Electric Oscillations." In this article it is pointed out that the necessity of obtaining some simple

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method of producing high frequency persistent or undamped electric oscillations for the accomplishment of wireless was evident at an early stage in the development of radio communication. It was first in 1900, when Duddell described his so-called musical arc, that the power of the direct current arc to become a generator of high frequency persistent oscillations was generally recognized. Duddell appreciated the fact that in order to produce such oscillations the arc itself, as a conductor, must have a falling characteristic curve; that is to say, it must possess a quality such that if current through the arc is increased, the potential difference of the carbons is decreased, and *vice versa*. Later Prof. Poulsen, of Copenhagen, made the important discovery that if the arc be formed in an atmosphere of hydrogen or hydro-carbon vapour, and be struck between electrodes of carbon (negative) and copper (positive), oscillations of great energy and frequency of the order of a million or so could be created in a suitable condenser-inductance shunt circuit. It was subsequently found that a strong transverse magnetic field across the arc was of great assistance. Poulsen applied, in 1903, for patents covering the application of his discovery to wireless telegraphy.

Dr. Fleming examines, in his article, the processes taking place in the arc-oscillation generator in the light of the electron hypothesis of electricity. He calls attention to the fact that in a gaseous conductor the current does not increase steadily with the potential difference of the electrodes, but tends towards a "limiting value" and that "as the ions are moved towards the electrodes, unless these latter remove them or absorb them sufficiently quickly, the accumulation of negative ions near the positive electrode and of positive ions near the negative electrode will diminish the potential difference of the electrodes and create a condition in which increase of current—that is the increase in migration of ions—causes a decrease in the potential difference of the electrodes." In this case there exists a falling characteristic or volt-ampère curve.

When the two carbons of an electric arc are first brought together to start it, the contact resistance causes their tips to become incandescent. When the arc is started a continual liberation of electrons takes place; these ionise the carbon vapour and liberate more ions. The potential difference of the carbons causes the positive and negative ions to migrate in opposite directions. If the current increases, the accumulation of ions reduces the potential difference of the carbons, and the result is a falling characteristic curve.

In an electric arc there is a double transport of matter. The positive carbon ions are heavier and slower in movement than the negative and the result is that an erosion of the positive pole takes place, a crater being formed in it, whilst a less rapid wear of the negative pole takes place, or even carbon may be deposited thereon, producing the "mushroom" tip.

Where an arc is formed in air an oxidation of the incandescent carbon takes place and many of the positive carbon ions are prevented from reaching the negative electrode, being oxidised on the way. The characteristic curve is not very steep, and an increase in the current does not result in a sensible decrease in the potential difference of the electrodes. If, however, the arc is formed in an atmosphere of hydrogen or hydro-carbon, which excludes oxygen from reaching the arc, then the removal or re-composition of positive carbon ions does not take place and a characteristic curve with a steeper downward slope is obtained.

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To form or maintain an electric arc it is essential that the negative electrode shall be incandescent; at the same time, it is an advantage to cool the positive electrode where an increase in the steepness of the characteristic curve is desired. Poulsen formed his arc between a carbon rod as the negative electrode and a water-cooled copper rod as the positive electrode.

Dr. Fleming gives a brief explanation showing why it is that a steep characteristic curve is of advantage and how this is utilised in the case of an arc shunted by a condenser and inductance to transform a direct into an alternating current and to obtain thus oscillations of high frequency possessing considerable energy. Poulsen's discovery enabled oscillations of a frequency of the order of one million or so, and therefore suitable for radio-telephony, to be obtained. The energy of these oscillations is increased by the use of a strong transverse magnetic field, but this field has the tendency to make the arc unstable and easily ruptured or destroyed. It is pointed out that the arc considered as a transforming device is not a very efficient one.

Some practical details of the Poulsen arc apparatus are given in the original article, as also a brief description of Dr. Fleming's own arc generator.

The work of other experimentalists in this field is also referred to and it is pointed out that "the conditions necessary for obtaining oscillations of a frequency suitable for radio-telephony seem to be that the arc shall be formed in an atmosphere not containing oxygen, and that the capacity and inductance in the shunt circuit shall be so adjusted that the natural frequency of that circuit shall not be less than about 250,000, whilst the ratio of the inductance reckoned in centimetres or electro magnetic units to the capacity reckoned in centimetres or electrostatic units shall be at least 20 or even 40. Under these conditions we obtain oscillations in the shunt circuit suitable for radio-telephony." Unfortunately the carbon arc generator possesses the unsatisfactory features of unsteadiness and liability to discontinuities or interruptions in the steady flow of oscillations. It is impossible to secure good telephony under these conditions. Dr. Fleming is of opinion that for radio-telegraphy some mechanical means of creating closely sequent or uniform musical spark discharges provides a more simple, efficient and easily controlled transmitter appliance than the arc generator and that for radio-telephony over short distances some modification of the thermionic generator employing a double anode or grid and plate in conjunction with a Fleming incandescent cathode in vacuo promises the best results. He recognizes the possibilities of the arc generator in connection with radio-telephony, if only some means can be discovered of creating an absolutely steady arc. It is a case for an extended and a thoroughly scientific research into the physical phenomenon attending the production and maintenance of the arc between solid and liquid electrodes.

Mr. Alfred Noyes contributes an article entitled "The Wireless Drama." He points out that "the world at large hardly realizes the immense changes which have been wrought in its own life by the invention of wireless telegraphy." He thinks that the centre of the romance of wireless is probably the apparatus on the roof of the Admiralty in London and hopes that, some day it may be written.

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Attention is drawn to the fact that in the Admiralty records of ships attacked by the "U" boat a large number of masters report that the enemy's first attempt has been to destroy the wireless aerials by gunfire, also that the adventures of the wireless operators are among the most stirring tales of the world-war. The experiences of one of these operators is related by Mr. Noyes.

The third article deals with "Ionic Valves" and is from the pen of Dr. W. H. Eccles, who points out that the vacuum tube as used in modern wireless telegraphy is one of the most striking examples of applied physics, for here some quite recondite regions of molecular physics are carried into actual manufacturing processes. In order to understand the uses of these vacuum tubes, and especially to plan new developments, some acquaintance with molecular theory is required." As an introduction, Dr. Eccles points out that great diversity exists in the nomenclature of these tubes and that no term is universally accepted. It is suggested that the term "ionic valve" is general enough to include all types. He then explains that the ion does not usually come into notice in the operation of valves unless, and until, it is charged electrically. The principal kind of ion, the atom of electricity, is usually called an electron; it is a disembodied negative charge quite devoid of matter. Positive ions, on the other hand are, so far as is yet ascertained, molecules of matter minus an electron. For simplicity, Dr. Eccles starts on the supposition that the ionic valve to be studied first is perfectly evacuated and that the solid parts—*i.e.*, the glass and metal —are perfectly free from occluded or absorbed gas. In such a tube containing a hot filament and one or more other electrodes, the whole of any current that is passed through the tube from a positive electrode to the filament, which acts as the negative electrode, is conveyed *by ions that are all electrons*.

"Thermionic theory," Dr. Eccles tells us, "shows that if the incandescent filament is absolutely clean, and if the vacuum is perfect, the rate of emission of electrons from each unit of area of filament surface can be calculated from the molecular theory of gases and the electron theory of conductors. On this latter theory, every conductor always contains a large number of free electrons interspersed between its molecules. The electrons are much smaller than the molecules, but share with them the irregular vibratory motion which we call heat. The electrons are at ordinary temperatures almost perfectly confined to the inside of the conductor by the inward attraction that exists at the surface of all solids. But as the temperature is raised the vivacity of the motion of both molecules and electrons increases till at 1,000° C. large numbers of electrons are continually breaking their way through the surface of the metal. The process is very analogous to the evaporation of a liquid, but in that case material molecules are escaping from the surface and forming vapour."

The dimensions of electrons are touched upon; their diameter has been estimated at $3{\cdot}7 \times 10^{-13}$ cm. whereas the diameter of a *molecule* of hydrogen is $2{\cdot}7 \times 10^{-8}$ cm., *i.e.*, 60,000 times greater. It has been estimated that the number of *free electrons* in a cubic cm. of cold metal is about $10^{22}$. When a tungsten filament is raised to a temperature of 2,300° C., $4{\cdot}3 \times 10^{19}$ electrons escape per square centimetre of its area, repre-

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senting a current of 0·67 ampères. The emission from earthy oxides when heated is much greater than that from metals, and therefore lime-coated filaments are sometimes used in certain types of valves.

The motion of electrons in an electric field is next examined by Dr. Eccles. He tells us that in rising through 1 volt the speed gained by electrons is 6,000 cm./sec. According to thermionic calculations the electrons escaping from the surface of a metal at high temperature have an average speed corresponding to less than $\frac{1}{20}$th of a volt. In thermionic valves the anode is as a rule a clean metal plate or cylinder placed at a distance of a cm. or less from the glowing filamentary cathode.

Dr. Eccles describes what takes place in such valves as follows:—

"The electrons escaping from the hot cathode find themselves in the electric field established by the battery which is connected between anode and cathode, and they gather speed corresponding to this potential difference, whatever the distance between the places, by the time they reach the anode, which is a matter of $\frac{1}{100000}$ second. Most of them enter the anode and, it is thought, join the current that passes along the external wires, flowing, of course, in the direction opposite to the nominal direction of the current. Some are reflected at the anode, but if no other conductor is near are drawn back by the electric field."

* * * * * * *

"The cloud of flying particles exerts electric force and, in virtue of their motion, magnetic force also. The latter, it is found, may be disregarded in practical applications, but the electric force has important consequences. It affects the potential gradient across the space between the two electrodes, with the result that the current is not proportional to the voltage as might at first sight be expected, but is proportional to the square root of the cube of the voltage."

Tubes provided with electrodes arranged on the above principle act as very perfect rectifiers of alternating currents, for when an E.M.F. is applied to the terminals of such tubes half of the complete wave produces a considerable flow of current, while the other half of the E.M.F. wave produces no current, and therefore the result is a pulsating unidirectional current. When a tube is to be used as an amplifier, the method in use consists in adapting a third electrode in such a manner as to influence the distribution of potential in the electron stream between anode and cathode, which in turn alters the value of the previously steady current through the tube. The most efficient arrangement of this third electrode, in the case of the pure electron discharge, appears to be that in which it is placed between cathode and anode in the form of a grid. Further details concerning these grids and sketches of some types of ionic valves are given in the original article. An expanded explanation of the action of the third electrode is also furnished by Dr. Eccles.

A description, with diagrams, is given in the original article of the "Circuits used with Valves." This part of the article deals with (*a*) the valve as generator of oscillations; (*b*) valve circuits for receiving (use of valve as a detector and use of valve as amplifier); and (*c*) use of valve in Beat Reception.

The fourth article is entitled "The Inductance Capacity and Natural

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Frequency of Aerials"; it is contributed by Professor G. W. O. Howe, who points out that an aerial may be regarded from two different standpoints; from one it is an oscillatory circuit, from the other an open transmission line. He considers the latter the more accurate and instructive point of view.

The subject is treated mathematically and cannot therefore be usefully condensed.

The fifth article is from the pen of Professor E. W. Marchant and deals with "The Heaviside Layer."

It is pointed out that many explanations were forthcoming in the early days of long distance wireless telegraphy to account for the fact that with an antenna, a few hundred feet high, signals could be sent round or over a wall of water and earth nearly 100 miles high, between the transmitting and receiving stations. "Two obvious theories," says Professor Marchant, "were advanced—the first, that the transmission was not really effected by electro-magnetic waves at all, but by currents distributed over the surface of the earth or water, a theory which had many facts to support it, the most notable of which was that the signals were transmitted more readily over sea-water than over land. . . . This theory still deserves consideration, as it seems likely that some of the energy received at a station may be transmitted by such means.

* * * * * * *

The second, and perhaps more obvious, theory is that the waves were diffracted round the earth's surface; and calculations have been made, and the theory of such transmission worked out, notably by Professor H. M. McDonald."

Professor Marchant refers to the suggestion put forward in 1900 by Heaviside that there existed in the upper regions of the atmosphere a permanently ionised layer capable of reflecting electro-magnetic waves; it is to this that the expression "Heaviside layer" has been applied. The fact that recently signals sent from Tuckerton, N.J., were received by the *s.s. Ventura* when 530 miles S.W. of Samoa, *i.e.*, at a distance of approximately 8,000 miles or nearly one-third the earth's circumference from Tuckerton, has naturally increased interest in the subject. "The Heaviside layer," Professor Marchant tells us, "is supposed to consist of a mass of ionised clouds or fog in the upper regions of the atmosphere, at a height of about 50 miles, which acts as a reflecting shell and behaves like an outer corona or spherical envelope to the earth, against which the electro-magnetic waves which transmit wireless signals impinge and from which they are reflected in much the same way as a hollow sphere with the inner surface made reflecting would reflect all light produced inside it. Although the earth and the Heaviside layer by this analogy might be regarded as equivalent to a polished ball with an outer concentric shell, having its inner surface polished, the phenomena occurring in wireless cannot be compared exactly with that existing in the space between the inner and outer spheres of such a model."

Professor Marchant refers in his article to the investigations carried out by Mr. L. F. Fuller, the remarkable results in connection with which were recently communicated by the latter to the American Institute of Electrical Engineers, and in conclusion summarizes the history of the

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Heaviside layer theory and some of the propositions that have been put forward to explain its existence. "All the evidence now recorded," Professor Marchant tells us, "supports the view that the Heaviside layer exists, and that it exercises an important influence on the strength of wireless signals received over very long distances."

In the sixth article entitled "Wireless to the Rescue" Mr. H. J. B. Ward makes a few remarks on the achievements of radio-telegraphy at sea. He points out that "it was not until wireless telegraphy had for nearly eighteen years been demonstrating its utility for sea-going vessels that the British Government issued, on the 20th of July, 1916, an Order in Council insisting upon the provision of a wireless installation in the case of "every British ship of 3,000 tons gross tonnage or upwards." The numbers of rescues effected annually at sea by the instrumentality of wireless telegraphy have been, he further points out, increasing in a geometrical and not an arithmetical ratio. A table is given of "Timely Rescues"; it covers more than nine closely printed pages of the *Year Book*.

In the seventh article Mr. C. H. Taylor describes "Some Features of the Long Distance Stations of the American Marconi Station" in an interesting article in which a great number of technical details are given.

In the eighth article Mr. W. P. Harris deals with "The Achievements of Wireless Telegraphy." He expresses the opinion that in spite of "widespread interest in the science and the constant record of progress which is brought under the eye of the intelligent newspaper reader, it is safe to say that very few members of the general public fully realize the ubiquity of wireless, its reliability and the extent to which it has contributed to the world's progress."

The important part wireless telegraphy is playing in this War, both on land and on the sea, is briefly touched upon. But, as Mr. Harris points out, wireless is best known for its services to mercantile vessels in the happy days of peace. He also informs us that the wireless service is now handling business messages at rates which are in all cases substantially lower than those of the cables, the Marconi Trans-Atlantic rate between London and New York, for example, being 8d. per word for ordinary telegrams as against 1s. per word by cable. These messages are transmitted directly and without relaying between the British shores and the coast of America by day as well as by night.

Mr. Harris sums up the present situation with regard to wireless in the following words:—"It is now possible to work regularly day or night over thousands of miles; automatic duplex high-speed working—once thought by most telegraph officials to be an absolute impossibility in wireless—is now firmly established; automatic recording of messages is carried out daily at many long-distance receiving stations; the apparatus on both ship and shore stations, once delicate and erratic, is now thoroughly strong, reliable and fool-proof, and manufactured to standard specifications. Accurate calculations of range and power has taken the place of the methods of trial and experiment, and if it is desired to erect a pair of stations to communicate over 2,000 miles, the specifications can be drawn up and the station erected with certainty that they will fulfil all requirements."

There are, it is pointed out, one or two outstanding problems requiring

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to be solved, but it is hoped that the experts who are tackling them will soon find an answer to the riddles Nature has set the world.

In an article entitled " International Time and Weather Signals " the opinion is expressed that wireless telegraphy will play a great part in days to come in regions of activity of which at present it only touches the fringe. Prominent among such future spheres of action is likely to be world-surveying. Through radio agency the differences of longitude between Paris and many French towns have already been established, as well as the difference of longitude between Paris and Washington, as stated earlier in this review. The Commissioners engaged on the Franco-Liberian and Franco-German frontiers resorted to wireless telegraphy for the purpose of determining the longitudes of the boundaries, and a similar use was made of wireless on the occasion of the rectification of the frontier line between Brazil and Bolivia. It is further expected that very considerable use will be made of wireless in the future in connection with time signalling and meteorological services. Particulars are given of the nature of the wireless time and weather signal services which have been provided by the various countries hitherto.

In an article giving " Particulars of Wireless Telegraph Patents in 1916 " it is stated that though far from reaching the pre-War standard, the number of patent applications filed during the past year is few short of 18,700. Applications with reference to wireless telegraphy and telephony, however, have exceeded by 50 the total number of similar applications filed in the year 1913, making in all 190 applications."

Attention is called to the fact that a system of compulsory licences has been introduced to enable British firms to work enemy patents on payment of royalties, such royalties being held in trust for the patentees by the Public Trustee.

Lists are given with brief descriptions of the British and United States applications for wireless patents during 1916.

" Definitions of Terms used in Wireless " are included in the volume under review. These have been compiled by Dr. J. Erskine Murray from the Report of the Committee of Standardization of the Institute of Radio Engineers and from other sources.

A " Dictionary of Technical Terms " in five languages, viz., English, French, Italian, Spanish and German and " Useful Formulæ and Equations " both specially compiled under the supervision of Dr. Erskine Murray are contained in the *Year Book*.

International units and symbols, other useful data, particulars concerning the leading companies engaged in the commercial development of wireless telegraphy, biographical notices of prominent workers in the wireless field, the literature of wireless telegraphy and telephony and directories of wireless societies and Lloyd's Signal Stations are also included in the volume and add very considerably to the usefulness of a valuable and well-got-up handbook, which ought to have its place with other leading books of reference in the busy man's office or library.

W. A. J. O'MEARA.

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# NOTICES OF MAGAZINES.

## *REVUE MILITAIRE SUISSE.*

*No. 4.—April, 1917.*

### On Cavalry.

The article begun in the *Revue* for February, 1917, is concluded in the number under review (see *R.E.J.*, June and July).

The writer of the original article expresses the opinion that Von Kluck made excellent use of the large cavalry force under his command. He certainly placed great confidence in the fighting qualities of his cavalry for it was on this arm that he relied to mask his movements, to prevent the enemy from penetrating into the gap created in the German front on the morning of the 6th September, 1914, and to frustrate, under excessively difficult circumstances, the hostile enveloping movements.

The important *rôle* played by the German cavalry at the Battle of the Marne comes home to us when it is remembered that it was at the time that Von der Marwitz made it known that he could no longer keep the enemy in check that definite orders for the retreat were given. It was the breaking point in the endurance of the cavalry that constituted the decisive factor in the situation.

The writer of the original article considers that the two factors which enabled the German cavalry to perform the task allotted to it with such success were first, the lack of energy and push in the handling of the British Army, and secondly, the fact that the two cavalry corps under Von der Marwitz and Von Richthofen composed really a combined force of some magnitude and one capable of acting independently on a wide front. It consisted of 12,000 sabres, 6 to 8 battalions of infantry and 72 guns, together with a large number of machine guns and cyclists.

It should be noted that it was by dismounted action that the German cavalry obtained nearly all its successes. To those who argue that infantry could have achieved results similar to those obtained by the German cavalry, the author of the original articles replies "Yes, perhaps." He is, however, of opinion that under circumstances similar to that in question, no other arm has quite the same value as cavalry. Infantry might have been able to do as much as the cavalry, but, he thinks, it *is very probable that it would have actually done less, owing to its comparative lack of mobility*. Infantry could not have reinforced threatened points with the same rapidity that the German cavalry succeeded in doing.

It is considered that the use that Von Kluck made of his cavalry during the Battle of the Marne affords a most interesting study in the tactical employment of that arm.

On no previous occasion in actual warfare has cavalry been called upon to play exactly the same *rôle* that Von Kluck's troopers played. Not that the principle involved was entirely new, for Article 481 of the Swiss Regulations, it is pointed out, lays it down that among the tasks

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that independent cavalry may have to undertake is that of "seizing or guarding points or sectors possessing strategic or tactical importance."

But what was not foreseen was the fact that a task of this kind might involve operations on so extended a front and last for so long a time as they did in September, 1914. The lessons learnt will, it is expected, not be lost sight of in the future. One of the most important tasks likely to be assigned to the larger formations of cavalry in future will be that of moving with rapidity to fill up large gaps in the battle front. The tactics employed on the Marne will no doubt be copied in such cases.

The writer of the original article feels the time is past when a large body of cavalry can hope to be able to deliver an effective charge, and cavalrymen must therefore become reconciled to the idea that their arm must fight dismounted to a great extent. Small bodies of cavalry, he thinks, may still be able to deliver a charge and cavalry should therefore always be on the look-out for an opportunity to do so; the present War affords many examples of charges being delivered by small bodies of cavalry. He does not agree with those who argue that the "cavalry spirit" will be adversely affected by the employment of this arm extensively in dismounted action. Indeed his own view on the subject is that the more cavalry is called upon to fight dismounted, the better mounted will it become and the better prepared will it be for mounted action. By employing cavalry thus the spirit of offensive action will be encouraged, a disposition to arrive at prompt decisions will be developed and a tendency to handle cavalry boldly will be inculcated. It is urged that cavalry should do its utmost to perfect itself in both kinds of fighting, and that it should devote more and more attention to that kind which is the newest and one in which it can do the most for its side. "*Let us learn*," says the author of the *Revue* article, "*to cover great distances across country in such a way as to arrive at the decisive point before the enemy does so, in order that we may surprise him, attack him and harass him by hanging on to his flanks.*"

It is further urged that the troopers should individually be taught to become good marksmen and that machine-gun teams should be taught to become adepts in handling their weapons in small groups, to run risks where the occasion requires and not to seek for protection too anxiously. To fulfil these duties with success, however, cavalry must be employed in force. "*A weak cavalry force*," says the author of the *Revue* article, "*serves no useful purpose whatever.*"

The use of large formations of cavalry alone without the addition of infantry units, it is suggested, will rarely be resorted to in the future; the tendency is towards the employment of *combined detachments*. It is suggested that it was largely due to the fact that battalions of Chasseurs and batteries of artillery accompanied the German cavalry that it met with so much success in the present War. If at times the rate of advance of cavalry was slowed down by the addition of the less mobile troops accompanying it, on the other hand when cavalry was held up the presence of these less mobile troops shortened the delay brought about by the resistance of the enemy.

It has been suggested that the German cavalry have on occasions made a misuse of their Chasseurs. Infantry have, in some cases, been started off two to three hours before the cavalry for the purpose of

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"*clearing the road.*" There is much to be said for employing the infantry in this manner, but the author of the *Revue* article considers that infantry should, as a rule, be employed to support the cavalry, to hold important points in rear of the advancing cavalry, either to keep the route open or in order that such points may serve as pivots of manœuvre. The infantry may also be with advantage employed to hold an enemy in front whilst the cavalry is busy sweeping round its flanks.

The art of handling a *combined detachment* is not something to be acquired by instinct alone; like other branches of the art of war it requires study.

So far as reconnaissance duties are concerned, the experience of the first two months of war on the Western Front teaches no new lessons. There is not sufficient evidence available yet to say whether better results can be obtained by employing a whole squadron, or whether by employing smaller groups of cavalry, for reconnoitring purposes.

The heliograph has proved itself an indispensable part of the equipment for cavalry.

The attachment of cyclists to the cavalry reconnoitring squadrons has also met with considerable success on the Western Front. The use of aeroplanes and observation balloons has not, in the opinion of the author of the *Revue* article, materially affected the importance of the reconnoitring duties formerly and still undertaken by the cavalry. Detailed information cannot be obtained by airmen; nor are they of much use in misty weather and in wooded country. Reconnaissance duty on the battlefield, however, falls exclusively in the province of the air service.

So far as march and manœuvre formations are concerned it is more than ever necessary to avoid massing the men; cavalry should move in echelons of squadrons and of troops with as great a distance separating the several units or groups as the situation will permit; attention is called to Colonel Carrère's *Cavalerie son Emploi dans la Guerre Moderne* (Lavauzelle, Paris, 1916). Further information on this subject can be obtained from the pages of the volume referred to.

The author of the *Revue* article in conclusion states that he has dealt more particularly with the German cavalry because he was able to obtain more information concerning it than concerning the cavalries of the other belligerent Powers. However, he recognizes that many valuable lessons are to be learnt from a study of the part played by the French, the Belgian and the British cavalry in the early operations of the War. He is convinced that there still remains a useful *rôle* for cavalry in modern war and quotes a passage from General Bonnal's *Les Conditions de la Guerre Moderne* which fully bears out his own contention that cavalry is far from being in a bankrupt condition but is still well able to undertake the obligation of paying its way to fame and glory in a modern theatre of war.

### The Italo-Austrian Theatre of Operations.

The present Italo-Austrian theatre of operations, it is pointed out, consists of two distinct regions, viz.:—The Trentino or Alps front and the Carso front.

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The *Revue* article is illustrated by diagrams showing in sectional elevation the different sectors of the two fronts (as below) and also a sketch map showing the Trentino region. The two fronts have together an extent of approximately 373 miles, from the Gulf of Trieste to the Stelvio Pass, and may be considered as being made up of the following five sectors:—

| | | |
|---|---|---|
| I.—The Julian Alps Sector (from Gulf of Trieste, south of Monfalcone to M. Cergnala) .. .. .. .. | 62 | miles. |
| II.—The Carnic Alps Sector (from M. Cergnala to Cra. di Casa Vecchia) .. .. .. .. .. .. | 75 | ,, |
| III.—The Cardoria Sector (from Cra. di Casa Vecchia to Val Sugana, south of Strigno) .. .. .. .. | 93 | ,, |
| IV.—The Dolomites Sector (from Val Sugana to Riva on L. Garda) .. .. .. .. .. .. .. | 62 | ,, |
| V.—The Judicaria-Stelvio Sector (from Riva to Stelvio Pass) .. .. .. .. .. .. .. | 81 | ,, |

The sectional elevations of these sectors published in the *Revue* bring home very vividly the very difficult nature of the theatre of operations in which the Italian Army is engaged.

Attention is drawn to the fact that the theatre in which the Italian and Austrian Armies are at grips at the present time has on many previous occasions been the battle ground on which nations have endeavoured to settle their quarrels; to mention but a few dates the author of the *Revue* article mentions the campaigns of 1796, 1797, 1799, 1805, 1848, 1859 and 1866.

In all these campaigns the main idea has been to seize the Trentino and the upper valley of the Adige. For it has always been felt that an army that obtained mastery of these regions obtained, at the same time, domination over the plains of Lombardy and the Po Valley.

The Italians have always looked upon the possession of the Trentino region as being of extreme strategical importance in relation to the defence of their country. This region is the key to the defence of the Po Valley and its possession excludes the possibility of a flank attack on any Italian Army in the Venetian theatre; from the Trentino lines of advance diverge on to the front Vicenza-Verona-Brescia (about 70 miles in extent).

The region is equally important from the Austrian point of view as providing a suitable central position from which Austrian Armies can advance to meet their enemies on hostile territory.

When Italy came into the War in 1915, the Trentino had not lost any of its former importance. It was rumoured during the winter of 1915 and 1916 that the Austrians intended to launch an offensive, in the grand old style, into the plains of Lombardy from the Trentino, hoping thus to threaten the Italian Army in the Venetian zone. Such an operation is one attended by certain difficulties owing to the fact that the Trentino is excentrically situated from the point of view of the railway communications of the Dual Monarchy; only two railways are available for the transport of troops and supplies to this front, viz.:—those in the Eisak and Puster Valleys which converge on Franzensfeste Railway Junction and lead thence to Trent (55 miles further south).

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The Trentino front from the Adige to the Val Sugana has an extent of nearly 45 miles, as the crow flies. It is at a considerable distance from the Isonzo front and provides neither shelter nor food for an army. Extensive preparations must therefore be undertaken in this region by armies intending to operate therein, and little secrecy can be maintained in relation to the military measures which may be put into execution.

The Italians have estimated that the Austrian Army concentrated in the Trentino consisted of 18 divisions and 2,000 guns of various calibres, including 40 12-in. guns, 4 15-in. guns and 4 16·5-in. guns: a total force of approximately 400,000 men.

The Austrian artillery attack began on the 14th May and reached its maximum intensity on the following day; towards the evening the infantry joined in the fight, which was of the character usual in mountainous countries, each side fighting for the possession of the highest ground.

An Austrian offensive for the possession of the plains of Lombardy and Venice affords the greatest chance of success if combined with an offensive from the east against the Isonzo front.

The Austrian offensive of 1916 was confined to the Trentino front; in consequence, the Italians were given an opportunity of concentrating the bulk of their army on this front.

Although the Italian left had at first to retire in the Adige Valley under the intense Austrian artillery fire yet finally it was able to hold up the Austrian advance at Ala (on the Adige) and at Pasubio further east. The Italians thus remained masters of the routes in the Adige Valley leading to Verona. The Italian centre, between the Terragnola and Astico Valleys, was at one time in extreme jeopardy. The intensity of the Austrian artillery fire caused the Italians to give ground and whilst they were doing so Austrian infantry deployed in considerable strength and forced the Italians to continue their retreat; on the 19th May, 1915, they reached Cimone, north of Arsiero. The retirement was continued towards the end of the month, and the Austrians very nearly succeeded in reaching the plains. However, the Italians in spite of the violence of the further Austrian attacks held on to their ground and checked the further advance of the enemy.

On the high plateau of the seven communes north of Asiago, the Italians were also obliged to abandon their first-line defences. On the 21st May, they retired to their second line at Mont Verena on the Campolong summit and later to the slopes of the Val d'Assa and those north of Roana. The Austrians were not able to continue their attacks, so that the Italians finally established themselves on the line Monts Pau and Magnaboschi and the heights south and east of Asiago. The situation which was a critical one for the Italians changed for the better on the 10th June, 1915. The possession of the region about Asiago by the Austrians would have enabled them to turn the Italian positions along the Val Sugana and to cut off all communication between the positions in question and the plain between Thienne and Bassano.

The Italian right was astride the Val Sugana, in the neighbourhood of Roncegno. Here also the Italians gave ground gradually and retired at first to their second line, Civaron-Telbe. On the 25th May, just at the time when the Dodici summit was abandoned by the Italian centre,

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their right was withdrawn still further to the eastward of the second line last referred to.

The Austrians attacked the Italian positions to the north of Asiago on the 26th May; the Italians in their turn counter-attacked and the operations in this region then came to a standstill also.

The author of the *Revue* article considers the operations on the Trentino front of special interest to the Swiss Army as containing valuable lessons in mountain warfare of the kind which this army might have to undertake.

The success which attended the first push of the Austrians was the natural sequel to the decision taken by them to launch the offensive at a time selected by themselves and in accordance with a programme prepared by themselves. The whole campaign bears the stamp of having been worked out with great exactness. The formidable Austrian offensive was met with skill and energy by the Italians in their defensive positions. Without losing sight of the necessity of holding the Austrians in the mountain regions, the Italian High Command concentrated a field army in the plains, ready to play its part should it be required to do so. Some idea of the magnitude of the task carried through by the Italian General Staff may be gathered from the fact that it involved the movement of half a million men, 75,000 animals and 15,000 vehicles, without taking into consideration the transport of enormous quantities of food supplies, stores and ammunition.—(*To be continued*).

## THE INSTRUCTION OF INFANTRY IN BATTLE TACTICS.

### *Instruction.*

The article begun in the number of the *Revue* for March, 1917, is concluded in the issue under review (*vide R.E. Journal* for July).

The author of the original article considers that the basis of instruction in the Swiss Army should be drills rather than manœuvres. To leave no doubt as to what he means a definition clause is added by him: "To drill is to repeat a movement, an evolution, a deployment, until perfection in execution of the same is obtained. To manœuvre is to apply in practice the lessons learnt at drill."

What, in Switzerland, is referred to as "company drill" consists, according to the author of the original article, as a rule in giving out some general idea, which starts with an advance guard or outpost scheme and develops into an extension for the attack or the execution of a deployment. A criticism on the exercise follows; this criticism may be sound but does not, it is suggested, teach either the men or their leaders how to correct the mistakes made. It is stated that all the failings of the Swiss infantry arise from the fact that they are not sufficiently well drilled.

Every situation arising at manœuvres requires a long explanation, whereas what is wanted is a series of short episodes, which can be repeated until the machine works quickly and correctly. The author gives schemes of instruction for the individual soldier, the group, section and company. The principal points to which attention is drawn are the following:—

I. *The Instruction of the Individual Soldier.*—Practical and theoretical

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instruction must proceed simultaneously As examples in practical instruction the soldier should be taught :—

(*a*). To make the best use of the features of the ground and to handle pioneer tools for the purpose of assisting him in the advance.

(*b*). To make the best use of his weapons at short ranges so as to assist him in the advance.

(*c*). To acquire skill in the use of the bayonet.

(*d*). To throw hand grenades properly.

II. *The Instruction of the Group.*—Some variety, it is suggested, should be introduced in the instruction now given by introducing incidents from the present War.

As examples the following exercises are suggested :—

(1). A group of bombers may be made to advance, under the protection of the fire of the remainder of the section (imaginary), and on arrival within throwing range, the group should make a bombing attack on the enemy.

(2). The group may be supposed to belong to the second wave and should be made to take cover, so as to avoid casualties from artillery fire directed at the first wave.

(3). The group may be employed on a " cutting out " adventure against imaginary hidden enemy machine guns.

(4). The group may be supposed to be nearly cut off in an isolated commanding position and should be withdrawn into a less dangerous position so as to gain time for the remainder of the company to come into action.

(5). The group may be employed on " sniping " expeditions.

III. *The Instruction of the Section.*—The points requiring special attention, in the opinion of the author of the original article, are :—

(*a*). The need for rapidity in taking up extended order formations.

(*b*). Skill in utilizing the features of the ground during an advance.

(*c*). Fire discipline.

(*d*). The delivery of the assault.

(*e*). In defence practices, the main thing is to teach a section to remain concealed as long as possible, and then suddenly to pour in heavy fire against a flank of an imaginary attacking force.

IV. *The Instruction of the Company.*—Small incidents or short phases of a battle should, it is suggested, be continually practised. The points requiring special attention are the same as those stated above in relation to the instruction of the section.

The author of the *Revue* article gives details of a number of incidents, etc., which may be practised.

V. *Co-operation with Machine Guns.*—Co-operation between infantry and machine-gun detachments is of the utmost importance. Instruction should be afforded in the co-operation between a section of infantry and a machine-gun detachment (*a*) during the advance from long and medium ranges and (*b*) in fire discipline.

Similar instruction should also be provided in relation to the co-operation between a company of infantry and machine-gun detachments.

VI. *Co-operation of the Several Arms of the Service.*—Owing to the importance of very close co-operation between the several arms in actual

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war, the necessity for combined training is more necessary than ever before. The author of the *Revue* article urges that even in combined training, the exercises carried out should be in the nature of drills and should not consist of manœuvres. Different phases of the attack, the counter-attack and the defence of positions should be executed as drills, full use being made for the purpose of all the most modern devices with which armies are to-day equipped.

## NOTES AND NEWS.

*International News.*—A reference is made to the entry of the United States of America into the great conflict of arms that has now been in progress for nearly three years. It is felt that the entry of the United States of America into the War is likely to make the position of neutral Switzerland at a Peace Conference one of considerable difficulty. The national conscience of Switzerland is torn by two conflicting forces, one impelling the Swiss to act honourably by their treaty obligations and the other demanding that steps shall be taken to safeguard the future interests and existence of the Confederation. Some anxiety is felt that the European States may not, *in 1918*, so readily accommodate themselves as they did in 1815, to acknowledge the state of Perpetual Neutrality by which Switzerland feels herself bound.

It is suggested that now Russia has got rid of an autocracy to the advantage of her people and the United States of America has come into the conflict for the protection of the rights of her people, whilst the Prussian Government has had to admit a check in relation to measures under discussion concerning the prime rights of the Prussian citizens, the signification of the Great War becomes clearly visible. It is a War for the emancipation of democracy. It is rapidly becoming apparent to all in Switzerland that in the defeat of the Central Powers lies the safety of the Swiss Confederation

The opinion is expressed that we are in sight of the end of the War and also that the Central Powers have been virtually defeated. The War represents a conflict between bureaucracy and liberalism, and it is bureaucracy that must go under.

It is pointed out that President Wilson is above all things a pacifist, but now that his country has been forced into the War he is determined to employ all the resources of the American Continent to fight not the German people but the German Government. He typifies the perfectly logical man. President Wilson's attitude, or rather his pacifism, forms an interesting and comforting contrast to that of the Russian extremists. The former's pacifism is that of an educated person, familiar with the lessons of history, who does not allow his humanitarian instincts to lead him to adopt a line of conduct which would completely overlook the realities of the situation, that is to say a pacifism which would make him an accomplice of evil doers. The pacifism of the Russian extremists, on the other hand, is the pacifism of ignorami. The intentions of these extremists may be of the best, but these extremists are steeped in mysticism ; and mysticism never yet was born of good sense. It is felt that the Russian extremists belong to that category of pacifists which wrecks nations and brings down misfortunes on their own heads and numberless others in a position similar to their own. This kind of

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pacifism has been seen in different guises in France, where it contributed to the lack of preparations existing in 1914, in spite of the teachings of 1870. Great Britain did not escape from its wiles, and pacifism might have brought about the downfall of the British Empire had not the Germans themselves applied the whip to the British conscience by invading Belgium. History teems with records of the mischief done by a certain kind of pacifism. Pacifism is good or bad, according as it is the attitude of a person with a clear brain and educated intelligence or that of a person with an illogical and unreasoning mind.

SUPPLEMENT.

A further part of the Supplement entitled *L'Occupation des Frontières par les Troupes Suisses en* 1870—1871 is issued with the number of the *Revue* for April, 1917.

Chapter III. relating to the Defensive Period (January and February, 1871) is continued in this part. This chapter deals with the "Occupation of the Western Frontier." The Federal Council seems to have formed the opinion that Bourbaki would withdraw his Army into Belfort. On the 17th January, 1871, the available troops of the Swiss 5th Division were called up for service; one of its infantry brigades and one of its artillery brigades had already been incorporated into the 3rd Division. The Headquarters of the 5th Division were established at Basle. On the following day the Commander of the Swiss Army, General Herzog, requested the Federal Council to send the troops of the 5th Division to Basle, and at the same time recommended that the 4th Division should be mobilized and concentrated at Bienne as a reserve. The move of the 5th Division to Basle was approved, but the Federal Council postponed their decision regarding the mobilization of the 4th Division.

Bourbaki had about this period ordered the French 24th Corps to occupy the Lomont Heights, in order to cover the plateaus adjacent to the great loop of the Doubs. After the battle on the Lisaine had finished, fighting between the French and German troops still continued for some days in the region contiguous to the Swiss frontier near Porrentruy, and, in consequence, on the night of 18th January, 1870, the French peasants in this region fled from their homes into Switzerland.

On the following morning thousands of refugees arrived at Porrentruy, where they were lodged and cared for by the Swiss. The situation was, however, one that caused much embarrassment to the Swiss military authorities.

General Herzog, having established his Headquarters at Basle on the 20th January, immediately wrote to the Swiss Government pointing out that the object the Germans had in view in acting on Bourbaki's left flank was to force the French troops into Switzerland.

The troops of the Swiss 5th Division commenced to arrive at Basle on the 21st January; at the same time definite information reached the Headquarters of the Swiss Army regarding Bourbaki's retreat. It became clear that the part of the Swiss frontier now most menaced was that in the region of Neuchatel and that there was no longer need for anxiety regarding the Basle frontier: in consequence, the Swiss

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5th Division was moved, on the evening of the date last mentioned, to Laufon (half-way between Basle and Delemont).

The situation had now so completely altered that orders were issued for the Swiss 4th Division to mobilize; four companies of Carbineers (of the Vaud) and a company of Guides (of Geneva) were also called up.

The Headquarters of the 4th Division were established at Chaux de Fonds (about 8 miles north-west of Neuchatel), and the units of the Division were located at various points in the Franches Montagnes and in the Juras north of Neuchatel; the positions selected being all occupied by the 27th January.

A collision now appeared imminent between a French Division that had arrived on the 20th January at Pont-de-Roide (about 17 miles west of Porrentruy) and German reinforcements which had arrived at Delle and Croix. The inhabitants of Abbevilliers, taking alarm, moved in a body into Switzerland.

Precautionary steps were taken, on the 23rd January, along the frontier by the Swiss military authorities in anticipation of a fight between the French and German troops, but no collision occurred in the neighbourhood of the Porrentruy frontier.

On the date last mentioned, the Swiss 5th Division was echeloned along the Delemont Valley and on the same day General Herzog established his Headquarters at Porrentruy. A few days later Von Manteuffel, having occupied Dôle, cut the direct communications between Besançon and Lyons. Reports reached the Swiss Headquarters on the 26th January to the effect that the whole of Bourbaki's Army was retiring on Pontarlier. The Commander of the Swiss Army at once adopted measures to meet this situation. The situation was now becoming critical and orders were given for the Swiss 4th and 5th Divisions to move to their left immediately, so as to cover the Neuchatel frontier more effectually. These movements were in progress when information arrived that a French force, estimated at about 40,000 men, had arrived at Morteau (about 12 miles south-west of Chaux de Fonds). Swiss troops were in consequence hurried to the neighbourhood of Locle (nearly opposite to Morteau) and other movements were also ordered.

On the evening of the 26th January, the Federal Council warned the Cantonal Authorities to arrange for the accommodation of 10,000 prisoners of war in the barracks at certain places named, and at the same time issued instructions regarding their treatment and the provision of guards.

The movements of Bourbaki's troops were from time to time met by alterations in the dispositions of the Swiss Army.

On the morning of the 28th January, a staff officer of the Swiss 12th Brigade had gone, in plain clothes, to Pontarlier in connection with a difficulty which had arisen in relation to a contract for the purchase of salt by the Cantonal Authorities of Neuchatel. He naturally took advantage of the opportunity to glean what information he could. He ascertained that there were 70,000 French soldiers in and around Pontarlier under General Clinchant, who had succeeded Bourbaki. He formed the opinion that some of these troops were still in a condition to give a good account of themselves, but that the greater part of them were utterly demoralized. The view was, he found, generally held that this French

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force would march into Switzerland. The increase in the number of French troops on the Swiss frontier led the Cantonal Authorities of the Vaud, on the 28th January, to call out the Militia in the frontier towns and villages of the Canton.

On the evening of the 28th January, General Herzog received information that a force of 120,000 French soldiers was in and about Pontarlier and that this force was marching southward on Mouthe with Von Manteuffel's troops on its heels. It was now felt that practically the whole of the Swiss western frontier as far south as Geneva was menaced, but that the situation at Porrentruy and Franches Montagnes had eased considerably. The Commander of the Swiss Army, in consequence, decided to move troops from his right wing to support the centre and left of the 4th Division (Headquarters, still at Chaux de Fonds). On the 29th January, the Headquarters of the Swiss Army were moved to Neuchatel, and certain changes took place in the dispositions of the 3rd, 4th and 5th Divisions to meet the latest situation on the frontier.

On the day previous to that last mentioned information had been received concerning the armistice concluded between the belligerent forces. In consequence, orders were issued that no French soldier was under any pretext to be allowed to enter Switzerland. In order to ensure the execution of these orders strong guards (found by the local Militia) were posted on all the frontier roads. An agreement was, at the same time, arrived at between Generals Herzog and Clinchant in this matter and the latter arranged to post guards also on his side of the frontier. However difficulties arose as large bodies of deserters and others suffering from smallpox crossed the Swiss frontier into Verrieres. The infectious cases were taken to Neuchatel and arrangements were at once made for the establishment of a quarantine station, under the Swiss Military Authorities, at Verrieres to deal with future cases.

On the morning of the 31st January the officer in command at Verrieres received information that Von Manteuffel declined to recognize the armistice as applying to the French Army of the East, and from a second message he learnt that a long column of French artillery was advancing on Verrieres and had already arrived to within 3 miles of the frontier. He at once blocked the roads and railways by placing his troops in position ; at the same time, he sent an orderly officer to interview the French Commander ; the French column was then within a quarter of a mile of the frontier. A French officer (of high rank) came up to the frontier to meet him and stated that he had received no orders as to entering Switzerland, or not, from higher authority ; however, he halted his force, in order that instructions might be sought from the Headquarters of the Swiss Army. Shortly afterwards instructions were received from General Herzog stating that if the French troops were driven back by the Germans they were to be allowed to enter Switzerland, but they were to be required immediately to lay down their arms. The French Commander on the spot hesitated to give the necessary undertaking to disarm his men. Whilst these negotiations were in progress, General Clinchant's senior A.D.C. arrived on the scene and asked to be taken to the senior Swiss officer at the nearest Headquarters. He came to enquire on behalf of his Chief whether in the event of the French Army retiring into Switzerland, it would be

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possible for the Swiss Authorities to feed these troops. During the interview the roar of artillery could be distinctly heard; an engagement between the French and Germans was in progress only a few miles distant.—(*To be continued*).

W. A. J. O'MEARA.

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## *RIVISTA DI ARTIGLIERIA E GENIO.*

### *October, November, and December*, 1916.

RÉSUMÉ OF MILITARY OPERATIONS FROM AUGUST TO SEPTEMBER, 1916.

The capture of M. Sabatino and of M. S. Michele being assured it only remained to possess the bridgehead of Gorizia and complete the storming of the imposing rampart on the heights immediately west of the city. The battles, sanguinary and incessant, were continued up to the 8th August. The broken and intricate nature of the ground, the numerous and powerful lines of defence erected by the enemy, the vicinity of Gorizia, a conspicuous centre for the enemy's resources, facilitated a tenacious defence, and assisted them in making violent counter-attacks. Step by step at the price of great sacrifices, the Italian infantry, with unceasing co-operation of artillery, gained the whole of the difficult ground, storming one by one the numerous trenches, surrounding and compelling the surrender of the enemy, and repelling violent counter-attacks.

The Tuscan Brigade (77th and 78th Regiments) and the 143rd and 144th Regiments of the 48th Division distinguished themselves by manœuvring in rear of the enemy's lines on T. Peumica and on the hill overlooking the village of Peuma, thus determining its capture. Other not less heavy counter-attacks of the enemy, preceded by powerful bombardment, were repulsed by the brave defenders of M. Sabatino and M. S. Michele.

On the afternoon of the 8th August owing to the victorious action of the Italians all the heights to the right of the Isonzo, with the bridgehead of Gorizia and the M. S. Michele on the left of the river, were in possession of the Italians. The lines of the Isonzo and the valley of Tolmino were entirely assured. At dusk, detachments of the Brigade-Casale and Pavia passed on to the Isonzo Ford, the bridges of which the enemy had damaged. A column of cavalry and of bersaglieri cyclists was sent in pursuit. Under the enemy's fire detachments of engineers speedily constructed bridges, and repaired those damaged by the enemy.

On the morning of the 9th August the Italians entered Gorizia while a column of cavalry and cyclists traversed the plain around the city, dispersing the last resistance of the enemy. On the 10th Italian infantry occupied the western slopes of the heights near Gorizia, and the lines of Vertoibizza more to the south.

The capture of Gorizia deserves to be considered as one of the finest military operations of Italy. In three days, the most important of the enemy's fortifications on the Isonzo front fell into her possession. It may be opportune to relate that during peace time Austria had always guarded Gorizia with the greatest care, especially during the time of Italian neutrality. Its value had been increased with defensive works,

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and the experience of the first months of the European war had rendered it formidable. On the declaration of war by Italy, strong and imposing forces had been concentrated at Gorizia by the enemy, who as attested by the prisoners, were under the illusion that the great endeavours made by the Italians to arrest the Austrian invasion in the Trentino would for some considerable time exhaust their offensive capacity.

In consequence the manœuvres by internal lines on the Isonzo front which were conducted with rapidity, precision, and secrecy, were responsible, on the morning of the 6th August, for the Italian offensive breaking in full violence against an enemy morally unprepared. The efficacy of the counter-attacks on Monfalcone completed the surprise.

On the same date the action of the Italian artillery showed a really classical example of concentration of fire against fortified lines. It was most minutely studied and prepared. Thanks to the exploration of the ground by aeroplanes, patrols, and optical observations, the enemy's positions were perfectly known and drawn on the map; the targets accurately distinguished in extension and in depth, and the range of fire established with scrupulous precision. In consequence, at a fixed moment, a storm of iron and fire was hurled unexpectedly on the enemy's positions, overthrowing the defences, beating down the parapets, destroying the stations and observatories, and thus interrupting communications. The advance of the Italian infantry was magnificent. After three days of unceasing action under the concentrated and violent fire of the enemy's artillery, mitrailleuses, and bombs, they overthrew the successive lines of the enemy's resistance, bayoneting the defenders, and strongly sustaining the intense bombardment and furious counter-attacks of the enemy.

*The Storming of the Lines of Carso beyond Vallone.*

On the day of the 6th August whilst on the southern margin of the Carso the Italians captured M. St. Michele in the zone of Montfalcone, and the 3rd and 4th Battalions of bersaglieri cyclists seized the heights of Quota 85, resisting several violent counter-attacks of the enemy. During the following days, up to the 9th, the enemy made desperate efforts to retake the position M. St. Michele; but each time was energetically repulsed, and also lost the village Boschini strongly fortified on the southern slopes of the mountain. Further south the Italian infantry stormed some trenches near S. Martino del Carso. On the 10th a vigorous assault was made against all the strong enemy's lines between Vippacco and M. Cosich, which was crowned with full success. The enemy in rout abandoned all the zone west of Vallone, maintaining only strong rear guards on the heights of Debeli and of Quota 121. Several other important places were occupied by the Italians. On the 12th the crest of Nad Logem, which was obstinately defended, was stormed by the valorous troops of the 23rd Division (Sardinian Grenadiers Brigade), Lombardy Brigade, 73rd and 74th Regiments, Catanzan Brigade, 141st and 142nd Regiments. At the same time the Italian troops seized upon Oppacchiasella and pushed forward to the occupation of about a kilometre east of that locality. Finally, on the southern margin of the Carso the heights of Quota 121 and of Debeli were captured by the Italians. On the following days, up to the 15th, very sharp actions

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continued with notable success to the Italians, who broke through lines of trenches east of Nad Logem and on the western slopes of M. Pecinka. After this, the operations, here as well as in the zone of Gorizia, were carried on in a methodical manner, owing to the necessity of reinforcing the troops and services, and systematizing the defence of the occupied positions, arranging positions for the artillery, and improving the communications. The work was disturbed by frequent storms which rendered difficult the conditions of camp life. During the operations from the 4th to the 15th August 18,758 prisoners, of whom 393 were officers, 30 guns, 63 bomb throwers, 92 mitrailleuses, 12,225 rifles, 5 million cartridges, 3,000 rounds for artillery, 60,000 bombs, and a rich booty of war material of every kind were captured from the enemy.

If the capture of the bridgehead of the town of Gorizia constituted a military event of the first order, the storming of the zone to the west of the lines of Vallone was of no less importance. The plain of Carso Goriziana dominated the smaller plains of the lower Isonzo up to Cormous and Gorizia, on the one side as far as the sea, and on the other to a formidable position protected by the deep depression of the Isonzo, improved on the flanks by the formidable bulwarks of S. Michele a Nord, Cosich, Debeli and Quota 121 to the south. The surface of the higher ground, broken by numerous shell holes, and undulating thus, created an intricate network of trenches, deeply excavated in the rocks, and furnished with numerous lines of barbed wire, which gave rapid and secure positions to the troops on the defensive. It was said that the Austrians considered that it was impossible for this complete and perfect position to be captured.

*Operations on the Remaining Fronts.*

During the period under consideration small operations of a diverse nature took place on the Stelvio with a view of improving the local occupations and preparing for a vast offensive. Those of greater importance were carried on in the steep and elevated mountainous zone between Avizio and the T. Vanoi-Cismon.

On the 21st the Italian columns advanced in the direction of Cima Cece and captured the important heights of Quota 2354 further to the south. On the night of the 23rd the enemy, by a violent attack, succeeded in retaking the position, but our counter-attack finally drove them out. Further to the south-west, Alpine detachments of the Feltre and M. Rosa Battalions, supported by a mountain battery, commenced an attack on the mountainous crest at the head of T. Vanoi (Cismon-Brenta). Overcoming the difficulties of the steep ground, the enemy's strong defences, and the bad weather which often prevented artillery action, they succeeded on the evening of the 27th August in storming the summit of Cauriol between steep rocks, at a height of 2,485 metres. On the following days the operations were extended along the crest north-east of Cauriol. The enemy soon concentrated a violent fire of artillery against the Italian positions and on the 3rd September launched two violent attacks. The Alpines of the Valle Brenta Battalion arrested the attacks each time, and finally broke through the trenches and dispersed the enemy, inflicting heavy losses.

Owing to the altitude and the steepness of the ground, the offensive

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operations in the Tofana zone were of great importance. Here, between the 22nd and 25th August, Alpine infantry detachments captured the strong positions on the slopes of Tofana 3a, and in the valley of Travenanzes, inflicting great losses on the enemy, and repulsing several counter-attacks. On the 7th September they occupied other positions on the slopes of Tofana 1a.

*January, February, and March*, 1917.

ON MINING IN TRENCH WARFARE.

The journal of the Military Service Institution of New York publishes regulations for mining work in trench warfare, of which we produce a translation.

1. Mining, like other operations should be undertaken with a well-defined scope, and following the progress established by the commandant of the sector, after consultation with his technical adviser.

The scope of these operations may by way of example be one of the following :—

(*a*). To gain ground, by the formation of craters that are at once occupied and connected with the rearward trenches.

(*b*). To destroy the enemy's trenches.

(*c*). To ascertain if mining work is being executed by the enemy.

(*d*). To stop the enemy's advance when opening out trenches in points of vital importance.

(*e*). To recover lost trenches.

2. *Project.*—The plan of work should be made after acquiring accurate information of the enemy's trenches by means of documents or if possible by aerial photographs. The geological nature of the sub-soil could be obtained from the sottaprefettura where maps of the sub-soil exist.

3. *Surprise.*—The works should be pushed forward with the greatest care, since surprise is the essential condition of success and because only under such conditions it is possible to anticipate the enemy's countermining work.

4. *Superintendence of the Work.*—The commandant of engineers of the army corps or of the division should holdh imself always *en courant* with the progress of the mining work of his sector by means of the Engineer officer charged with its execution ; after communication with the General Staff of the great unit, he will impart his instructions, and any change in the progress of the mines, for countermining work, and firing the mines, etc.

5. *Attack.*—For an attack on a system of the enemy's mines it is necessary to carry the mines under those of the enemy ; it is usual only to fire petards (*camouflets*) in the direction of the galleries of the enemy's mines, locating them so as not to cause damage to our own mines by the explosion.

If the project is to attack by means of mines and to dislodge the enemy from his trenches, artillery and rifle fire should be opened against the said trenches so as to induce the enemy to assemble his troops previous to an attack, and then to fire the mine at an opportune moment.

6. If it is intended to occupy the enemy's trenches in such a manner as to drive out the defenders, it is necessary to launch the infantry on the attack at the moment of the explosion without waiting for all the

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earth to settle and the smoke to vanish ; when factories have to be blown up it is necessary to wait a little to avoid accidents that might occur from falling material such as beams, stones, etc. These however would be of slight importance in view of the losses that would be incurred from the enemy's fire, especially of mitrailleuses, if he should be left time to recover from the surprise of the explosion.

The attacking infantry should be accompanied by bombers with the usual scope of overcoming the eventual resistance on the part of the adjacent trenches, and to constitute defences for the flanks.

7. *Premature Firing of Mines.*—It is necessary to be careful to avoid firing mines before the moment at which they would have good effect ; otherwise, the enemy would not be disconcerted and would again occupy the craters formed. The frequent explosion of the enemy's mines executed prematurely when they were still at a distance from our lines, are stated, perhaps rightly, to have been caused by panic and demoralization.

8. When the enemy has exploded a mine prematurely, possibly from nervousness, or it may be to render the ground unusable for mining work, the best method is to direct a gallery towards it so as to gain possession of the crater, and to turn around it and proceed.

9. When the enemy has exploded two mines at a certain distance from each other, it is best to wait until he pushes forward a gallery between the two craters ; in this case it is advisable to arrange small mines in the branches of the gallery that may be formed in that direction, and to proceed with the work of excavation of the main gallery.

10. *Listening Service.*—The man on guard, listening in the galleries, should be free from all equipments, experience teaching that it is necessary to avoid the smallest sounds which might be mistaken for work far from the mine. The listening service should be carried on at determined intervals and amidst absolute silence, and immobility of everyone found in the gallery.

11. It should not be forgotten that after the explosion of a mine the gallery leading to it remains still utilizable up to 2 or 3 metres from the crater ; in occupying a crater formed by the explosion of the enemy's mine it is advisable to be content with holding the extremity nearest to our positions, until listening galleries can be pushed forward.

12. It may be necessary for the listening services to excavate deep pits with short branches for listening galleries ; in other cases the construction of blind galleries is sufficient.

13. When it is known that the enemy is engaged on mining work but has no indication of the direction of the attack, the listening galleries should be connected laterally at about 20 metres from our trenches.

14. In all the listening galleries when it is known that the enemy is working at mines or countermines in the vicinity, holes should be perforated about 15 to 25 cm. in width and 4 to 5 metres in depth for the purpose of placing and exploding charges of from 22 to 44 kg. of explosives. For this purpose there should always be about 100 kg. of explosives in readiness.

15. Listening galleries should never be left without sentries.

16. Long galleries may be excavated to a length of about 270 m. ; where galleries have to be made of this length it is preferable to make

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them deep, so as not to run the risk of meeting the enemy's countermines, or of sustaining losses from the fire of guns of heavy calibre.

17. In long galleries a small binary should be used with little cars to accelerate the removal of the earth.

18. Where it may be necessary to abandon temporarily part of a long gallery it is necessary to place and explode a charge to prevent the enemy from breaking through, and the side towards the enemy should be closed by sandbags so arranged that when the enemy removes them he closes the circuit of an alarm bell and automatically causes the explosion of the charge.

19. A straight gallery on a level plane requires less ventilation than an uneven gallery with turns; in a well-constructed gallery one ventilator every 30 m. is sufficient, while in a badly constructed gallery in similar ground a ventilator is required at about every 12 m.

20. For rapid progress the first half or two-thirds of the gallery should be 1·20 m. in height for about 1 m. in width at the base.

21. In the construction of a gallery in argillaceous dry soil, where few beams are required to sustain the earth, it may be possible to give an elliptical shape which sustains itself and the following system may then be employed :—Eight miners work for a relief of eight hours alternating by squads of four each hour; in the squad one digs, a second splays the earth, and the other two fill the sandbags taking it thus in turns so that the miner at the head being frequently changed can work with energy. Fatigue parties of infantry carry the sacks to the mouth, forming a chain, and emptying them in old trenches, in craters, etc., in places concealed from view, carrying back the empty sacks. The progress of excavation is a little more than 7 metres a day with a maximum of about 12 m., and a minimum of 5·5. When it is necessary to support the excavation a frame should be placed at each 1·20 to 1·80 m.

22. It is necessary to remember that excavation in blue argillaceous soil requires little or no framing, but after some time the consistency of the earth diminishes and produces looseness and landslips where there are no supports; when this process of dissolution commences great movements of strata may be produced. In yellow soil this does not take place to the same degree.

23. *Ventilation.*—In long galleries exceeding 90 m. when the air in the galleries becomes foul it is necessary to renew the air by a ventilating fan or bellows. Two of these instruments may be united by a tube for conducting the air and connected by the necessary metal joints.

24. When the gallery is of considerable length, or more than 100 m., ventilation may be increased by means of a small stove placed in a pit at the end of the gallery to promote a current of air. In this case it is necessary to ensure that the smoke from the stove should be carried away outside by means of a good pipe or chimney.

25. *Mineshafts.*—When in progress of mining, as for example an attack on a salient, two long galleries are provided; it is not advisable to start both galleries from the same shaft, as the excavation for the shaft requires longer time and presents greater difficulties than that of the galleries.

26. *Removal of the Excavated Soil.*—In good soil the excavation proceeds more rapidly than the removal of the earth. To facilitate this

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the best plan is to make smooth the floor of the gallery and to draw the bags of earth along this by ropes attached to small cars up to the shaft where a man can liberate the full sacks from the ropes. This system avoids all noise and reduces the number of men employed in the gallery and gives greater rapidity of work than by the passage of the sacks from hand to hand.

27. *Borers.*—Boring instruments—"Burnside"—noiseless, for perforations of 15-cm. diameter can be used where the ordinary system of opening out galleries is not convenient owing to the small depth of the excavation, or for want of time; from the more advanced point of the gallery several perforations are made at suitable angles to arrive under the enemy's trenches. With these boring instruments perforations of 9 m. or more can be made with a rate of progress of from 1·8 to 2·4 m. per hour.

28. *German Mine System.*—The German system does not differ greatly from ours, but they make greater use of borers of which there are two types but with these they are not able to perforate beyond 17 m. owing to the inclination of the bore to the horizon being such that a greater distance is not feasible.

*Suggestions from the Experience of the Present War.*

29. *Mine Galleries.*—It is preferable to attack points of the enemy's trenches between the openings of two communication trenches. Such points should be ascertained and the galleries directed towards these points and then if there is time the heads of the two galleries should be connected with another transverse gallery and the charges placed in diverse points under the enemy's trenches. The mines that correspond with the positions of the communication trenches should be first exploded so as to prevent the arrival of reinforcements. It is essential that this work should be placed in the hands of skilled sappers.

30. *Countermines.*—Men should be selected for the purpose of listening for the work of the enemy's miners; they should be practised for listening in our own mining works.

In tracing listening galleries, it is well to remember that the probable direction of the enemy's galleries is towards our communication trenches. Countermining work requires more skill than mining work; attempts at the former work made by less practised miners have not been successful.

*Examples of Mine Exploding.*

A.—Depth of shaft 4·8 m.; length of gallery about 71 m.; distance of mine cavity from the enemy's trenches from 1·5 to 3 m.; the charge is about 450 kg. of guncotton, placed in a mine cavity of $90 \times 90 \times 90$ cm. at the head of the gallery; the tamping consisted of a first solid banking of sandbags of about 2 m. in thickness and a similar second one distant 1·5 m. from the first and about 45 cm. in thickness. The explosion destroyed 72 m. of German trenches.

B.—Depth of shaft 4·8 m.; length of gallery about 66 m.; charge 292 kg. of gunpowder, in a cavity of $60 \times 90 \times 90$ cm. The tamping consisted of three bankings; the first 2·10 m. in thickness, the second distant 1·2 m. from the first 1·5 thick; the third 1·5 m. from the second, 1·5 in thickness. This effected the destruction of the mouth of the communication trench and overturned the trench for about 27 m.

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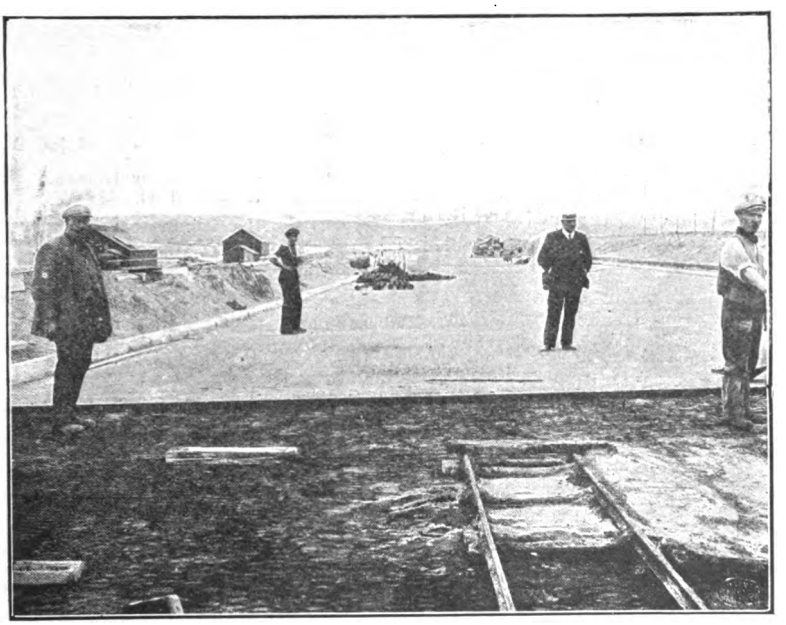

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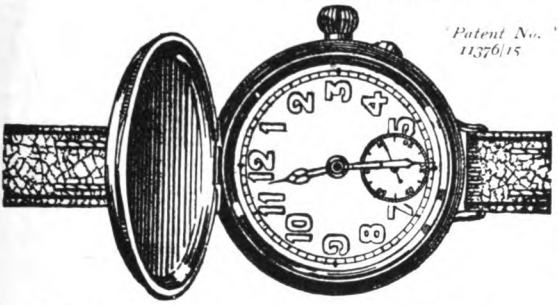

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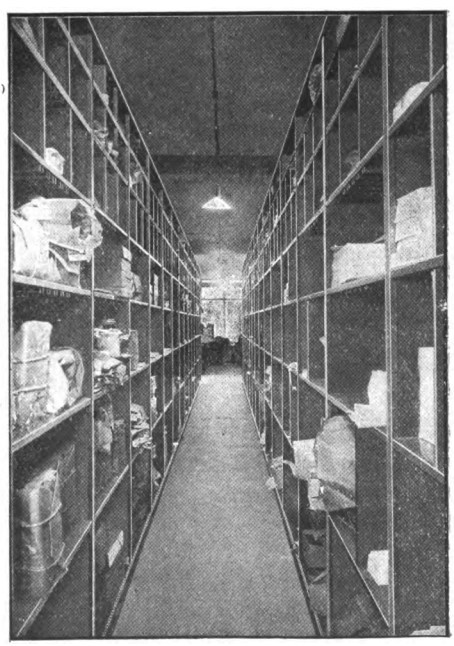

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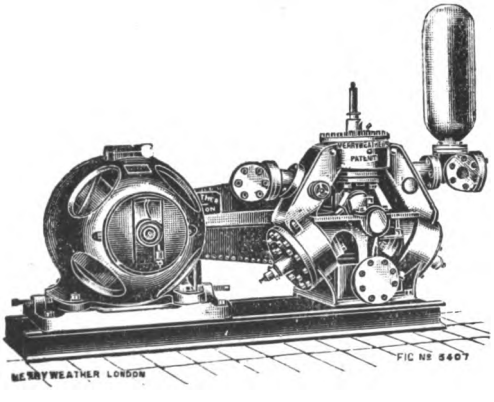


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# *THE DESIGN OF TIMBER COLUMNS FOR USE IN THE FIELD.*

*By* CAPT. J. W. LANDON, *Asst. Instr. in Fortification, S.M.E., Chatham.*

IN the volumes of *Military Engineering* there is no information with regard to the design of composite columns which are built up of spars or cut timbers. It has been suggested that the following few notes might be useful to some readers :—

The working load for each of the separate members of a composite wooden column is assumed to be that found from Gordon's formula with the empirical coefficients given in *M.E.*, Part IIIA., p. 39.

The formula is :—

$$P = \frac{rA}{1 + a\left(\frac{l}{d}\right)^2}$$

where P = the safe working load, axially applied.

$r$ = the allowable compressive stress for very short columns, in which failure occurs by direct compression, and is not due to buckling.

A = the area of cross-section.

$d$ = the length of the axis on the cross-section, perpendicular to the assumed axis of buckling. In solid columns of rectangular cross-section $d$ = the least dimension, if the strut is free to buckle about any axis.

$l$ = the unsupported length of the column, measured in the same units as $d$.

$a$ is an empirical coefficient which varies with the end conditions and with the shape of the cross-section.

Assuming the ends rounded, for a solid strut of circular cross-section $a = \frac{1}{48}$, and for a solid strut of rectangular cross-section $a = \frac{1}{62}$.

It is not proposed here to discuss the accuracy of this formula, or its agreement with practical tests. Different authorities differ by considerably more than 100 per cent. in their estimate of the safe working load on wooden struts. The formula above, for moderately long struts, gives loads which are considerably less than those used by some authorities, but for field purposes this is probably desirable.

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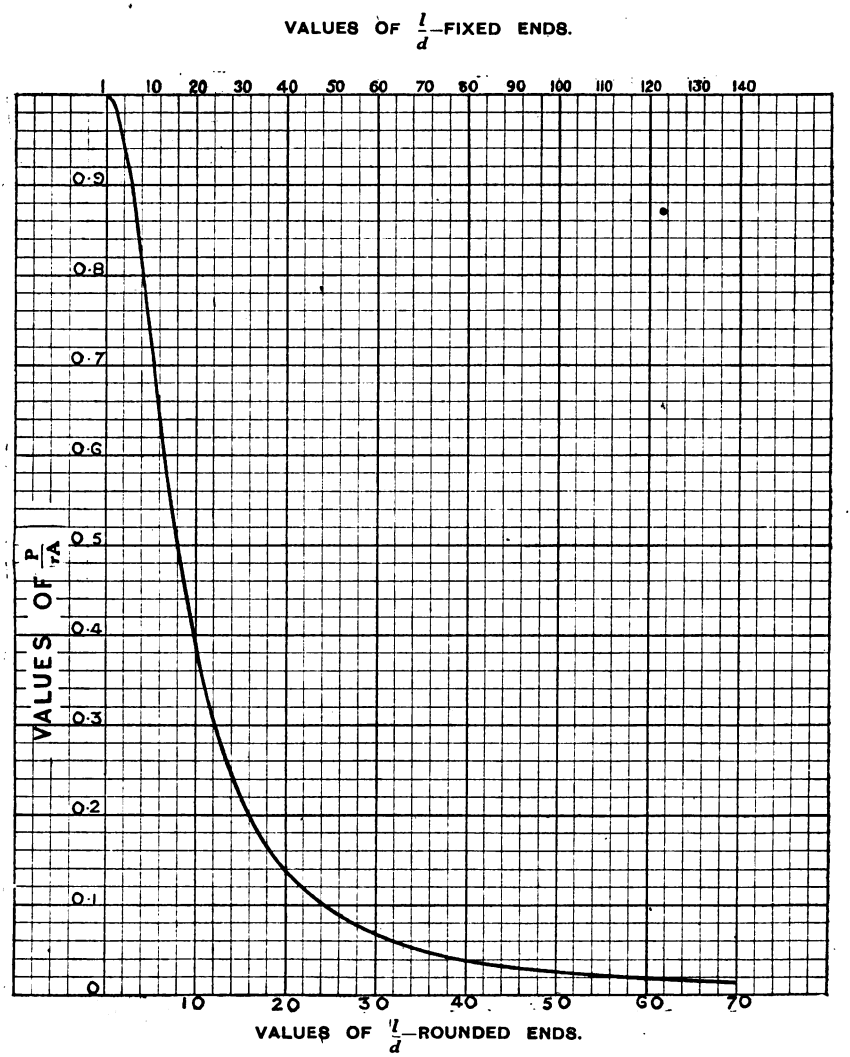
# SOLID TIMBER COLUMNS OF RECTANGULAR CROSS-SECTION.

## GRAPH FOR GORDON'S FORMULA.




NOTE.—For solid members of circular cross-section multiply the true value of $\frac{l}{d}$ by 1·14 before reading off on the graph.

FIG. 1.

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In *M.E.*, Part IIIA., for $\frac{l}{d}=48$ the rough rule for designing struts gives a safe load for solid members of rectangular cross-section more than six times the safe load given by Gordon's formula. In this rule there seems no doubt that the ends are supposed fixed, and not rounded as stated.

Some useful graphs which have been plotted from Gordon's formula are given on *Plates* XII., XIII. and XIV. in *M.E.*, IIIA. For many purposes the graph given in *Fig.* 1, which is also based on Gordon's formula, is rather more useful and general for solid members of rectangular cross-section. In this graph the ordinate gives the load per unit area of cross-section assuming unit value of $r$, *i.e.* the value of $\frac{P}{rA}$. The abscissa gives the values of the ratio $\frac{l}{d}$, the top scale referring to fixed ends, the bottom scale to rounded ends.

The same graph may also be used for solid spars of circular cross-section if the ratio $\frac{l}{d}$ is multiplied by $\sqrt{\frac{6\frac{2}{3}}{48}}$ or 1·14 before being read off on the graph.

Some examples of the use of this graph are given later.

With regard to end connections for struts which fail by buckling, the term "rounded ends" seems quite definite, and such a strut normally buckles as shown in *Fig.* 2 (*a*).

It seems desirable to distinguish between "flat ends" and "fixed ends." In the case of a strut with flat ends buckling may occur as shown in *Fig.* 2 (*b*). In the case of a strut with fixed ends buckling will occur as shown in *Fig.* 2 (*c*). The strength of a strut with fixed ends may be taken as the same as a strut with rounded ends of one half the length.

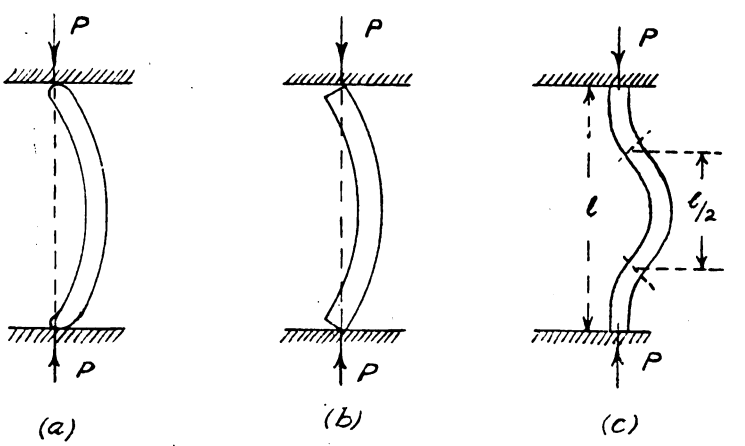


FIG. 2.

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With long struts, before an end can be considered fixed the fixing must be very thorough and no yielding must be possible. In the ordinary methods of connection employed in the field the fixing will be far from perfect, and the ends should generally be considered rounded. Any additional strength which the column may have, due to a partial fixing of the ends, is of an indeterminate amount, and should be left to increase the factor of safety.

In columns used in field structures, such as trestle legs, derrick spars, etc., the load is rarely axially applied, and the eccentricity of loading is such as to cause a bending moment, usually of unknown amount, tending to buckle the column in a particular plane. This can be allowed for in most cases by using a low value of $r$, as is done in *M.E.*, IIIA.

For trestles made of cut timbers such as are shown in *Figs.* 5 and 6, if care is taken to ensure that the transom load is shared evenly between the different transom members, the resultant thrust on the legs will cause a bending moment in the plane of the trestle tending to buckle the legs outwards. This is due to the bending of the loaded transom which causes the intensity of pressure to be greater on the inside face of each leg than on the outside face.

In a spar trestle, when a single transom member is lashed to the legs, the tendency will be to buckle the legs out of the plane of the trestle. Here the eccentricity of loading will be comparatively large and of a definite amount. If the leg is strong enough to safely carry the load, the deflection due to bending will be quite small compared with the eccentricity of the loading, and we may in such a case calculate the maximum compressive stress set up in the leg.

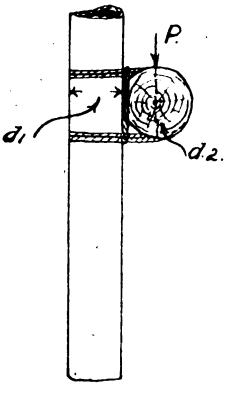


FIG. 3.

From *Fig.* 3 it is seen that the stress at any point in the cross-section of the leg may be considered of two parts.

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(1). The uniform compressive stress $\frac{P}{A}$, where A is the area of cross-section.

(2). The compressive stress due to a bending moment of magnitude

$$P\frac{(d_1+d_2)}{2},$$

where $d_1$ is the diameter of the leg, and $d_2$ is the diameter of the transom.

The maximum value of this stress

$$=P\frac{(d_1+d_2)}{2}\times\frac{32}{\pi d_1^3}$$

$$=\frac{P}{A}\left\{\frac{4(d_1+d_2)}{d_1}\right\}.$$

The total maximum compressive stress

$$=\frac{P}{A}\left\{1+4\frac{(d_1+d_2)}{d_1}\right\}.$$

Let $d_1=6''$ and $d_2=10''$, sizes common in trestles for bridges to carry infantry in fours.

The maximum compressive stress

$$=\frac{P}{A}\left(1+\frac{64}{6}\right)$$

$$=11{\cdot}7\frac{P}{A}$$

$=11{\cdot}7$ times the mean compressive stress.

It should be noted that this maximum stress will occur whatever be the length of the leg.

Take the allowable compressive stress along the grain equal to 1 ton per square inch. This gives a factor of safety of about 3 for seasoned Baltic fir.

The safe working load for the leg is given by—

$$P=\frac{rA}{11{\cdot}7}$$

$$=\frac{1\times\pi\times36}{11{\cdot}7\times4}\text{ tons}$$

$=2{\cdot}42$ tons (dead load).

Let the leg have an unsupported length of 12 ft., and a mean diameter 7 ins. (6-in. diameter at the point where the transom is attached).

$$\frac{l}{d}=\frac{144}{7}=20{\cdot}6.$$

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From the graph (*Fig.* 1)

$$\frac{P}{rA}=0{\cdot}1.$$

$$\therefore \quad P=0{\cdot}1r\frac{\pi\times 49}{4}$$

$$=3{\cdot}85r.$$

This should be equal to 2·42 tons if the two methods of design are to give the same result.

$$\therefore \quad 3{\cdot}85r=2{\cdot}42,$$

or $r=0{\cdot}63$ tons per square inch

$=1410$ lbs. per square inch.

Hence, if we use the strut formula (*Fig.* 1), in order to allow for the eccentricity of loading for this value of $\frac{l}{d}$, the value of $r$ should be reduced from 2,240 lbs. per square inch to 1,410 lbs. per square inch.

If we take the same value of $r$ equal to 1,410 lbs. per square inch, and use it for calculating the working load for a length less than 12 ft. we shall get a greater working load and our factor of safety will be less than 3. If the length is greater than 12 ft. we shall get a less working load and our factor of safety will be increased.

This example serves to emphasize the serious effect, so far as strength is concerned, of non-axial loading when the eccentricity is large.

It would be much more satisfactory, in a case such as that just discussed, to estimate the strength by the first method where the factor of safety is more or less definite. This unfortunately means more work on the part of the designer.

If two spars are used, one lashed on either side of the legs, then assuming they each carry half the load, the resultant thrust on each leg should be approximately along the axis. For a given load the size of the leg may be considerably less than in the case where a single transom member is used. The equalizing of the load carried by each transom member may be effected by the arrangement shown in plan in *Fig.* 4.

PLAN.

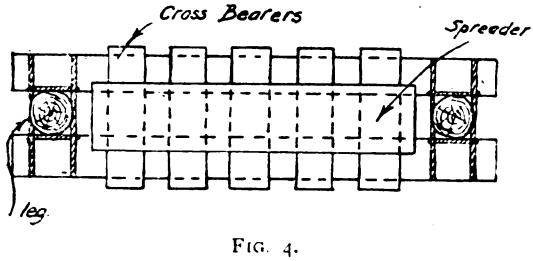


FIG. 4.

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In columns which are built up of several timber members, bolted or keyed together, experiments have shown that, when failure occurs, each member practically fails as an independent unit, and the ultimate strength of such a column is not substantially greater than the sum of the strengths of the separate members. Connecting the members by bolts, nails, lashings, etc., or by any method likely to be used in the field, is not sufficient to prevent the small amount of relative sliding which occurs when each member starts to fail as a separate unit.

This simplifies the calculations for composite members. The method of connection may be such that particular members of a composite column must buckle in a particular way, but in every case the strength of the column as a whole must be estimated by considering the strength of each member separately.

A few worked examples are given below :—

EXAMPLE (1).—Required the working load, axially applied, for a strut of 9″ × 3″ seasoned Baltic fir, 12 ft. long, with rounded ends.

The value of $r$ may be taken as 1 ton per square inch.

$$\frac{l}{d}=\frac{144}{3}=48.$$

From the graph, *Fig.* 1—

$$\frac{P}{rA}=0{\cdot}025.$$

$\therefore$ working load $=0{\cdot}025\times 2240\times 9\times 3$

$=1510$ lbs.

If the ends are fixed

$$\frac{P}{rA}=0{\cdot}1.$$

$\therefore$ working load $=0{\cdot}1\times 2240\times 9\times 3$

$=6050$ lbs.

EXAMPLE (2).—Suppose the member in Example (1) is prevented from buckling about the longer axis of cross-section and can only buckle about the 3-in. axis—

$$\frac{l}{d}=\frac{144}{9}=16.$$

From the graph $\frac{P}{rA}=0{\cdot}19.$

$\therefore$ working load $=0{\cdot}19\times 2240\times 27$

$=11500$ lbs.

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EXAMPLE (3).—A derrick of 20 ft. unsupported length is made of three recently-felled spruce spars of mean diameter 5 in., lashed together at intervals. What is the maximum dead load such a composite spar can carry ?

The ultimate compressive stress of seasoned spruce may be taken as 6,000 lbs. per square inch. For green spruce we may take 3,000 lbs. per square inch. Allowing for the fact that the load will probably be somewhat eccentrically applied, we will take $r=\frac{3000}{5}=600$ lbs. per square inch.

The value of $\frac{l}{d}=\frac{240}{5}=48$.

Taking a value $\frac{l}{d}=48\times 1\cdot 14=54\cdot 7$ on the graph, and reading the value of $\frac{P}{rA}$ for rounded ends we get—

$$\frac{P}{rA}=0\cdot 02.$$

The safe load for the 3 spars

$$=3\times 0\cdot 02\times r\times A$$

$$=\frac{3\times \cdot 02\times 600\times \pi\times 25}{4}\text{ lbs.}$$

$$=706\text{ lbs.}$$

EXAMPLE (4).—Two 6-in. × 3-in. Baltic fir members are to be used for the leg of a trestle which has to carry a dead load of 3 tons. The leg can be braced so as to prevent buckling in the plane of the trestle, but not so as to prevent buckling perpendicular to the plane of the trestle. What is the maximum length the leg can have and at what intervals must it be braced ? (See *Fig.* 5).

Ends must be considered rounded.

Load to be carried by each 6 in. × 3 in. member equals 1·5 tons.

Consider buckling in the plane of the trestle.

Take $r=1{,}800$ lbs. per square inch to allow for eccentricity of loading

$$\frac{P}{rA}=\frac{1\cdot 5\times 2240}{1800\times 18}$$

$$=0\cdot 104.$$

From the graph $\frac{l}{d}=23\frac{1}{2}$.

$\therefore$ $l=23\cdot 5\times 3=70\cdot 5$ in.

Greatest unsupported length = 5 ft. $10\frac{1}{2}$ in.

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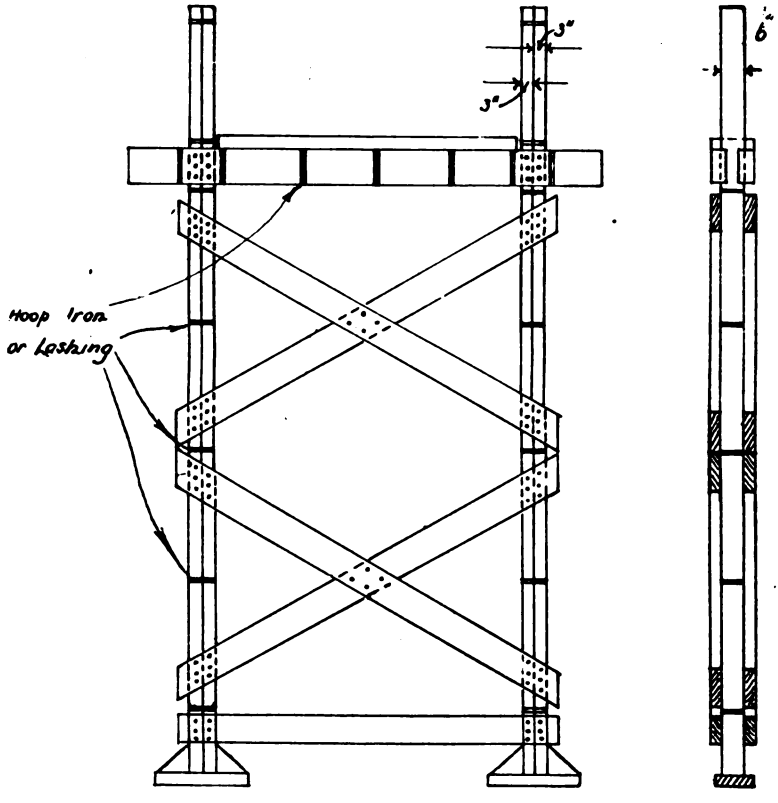


FIG. 5.

Considering buckling perpendicular to the plane of the trestle,

$$\frac{P}{rA}=0{\cdot}104.$$

From graph $$\frac{l}{d}=23\tfrac{1}{2}.$$

Greatest unsupported length $=6\times 23\tfrac{1}{2}''$

$$=11'\ 9''.$$

The two members of the legs may with advantage be nailed together, and bound at intervals with hoop iron. The bracing must be well fastened, and should be the same on both sides of the sides of the trestle to prevent a twisting action on the legs. It must be so arranged that it actually does prevent a movement in the plane of the trestle of the middle point of the leg in this case.

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EXAMPLE (5).—The leg of a trestle is made of four Baltic fir 11-in. × 2-in. planks nailed together to form a box as shown in *Fig.* 6. It is 10 ft. long. What dead load can be safely carried by it ?

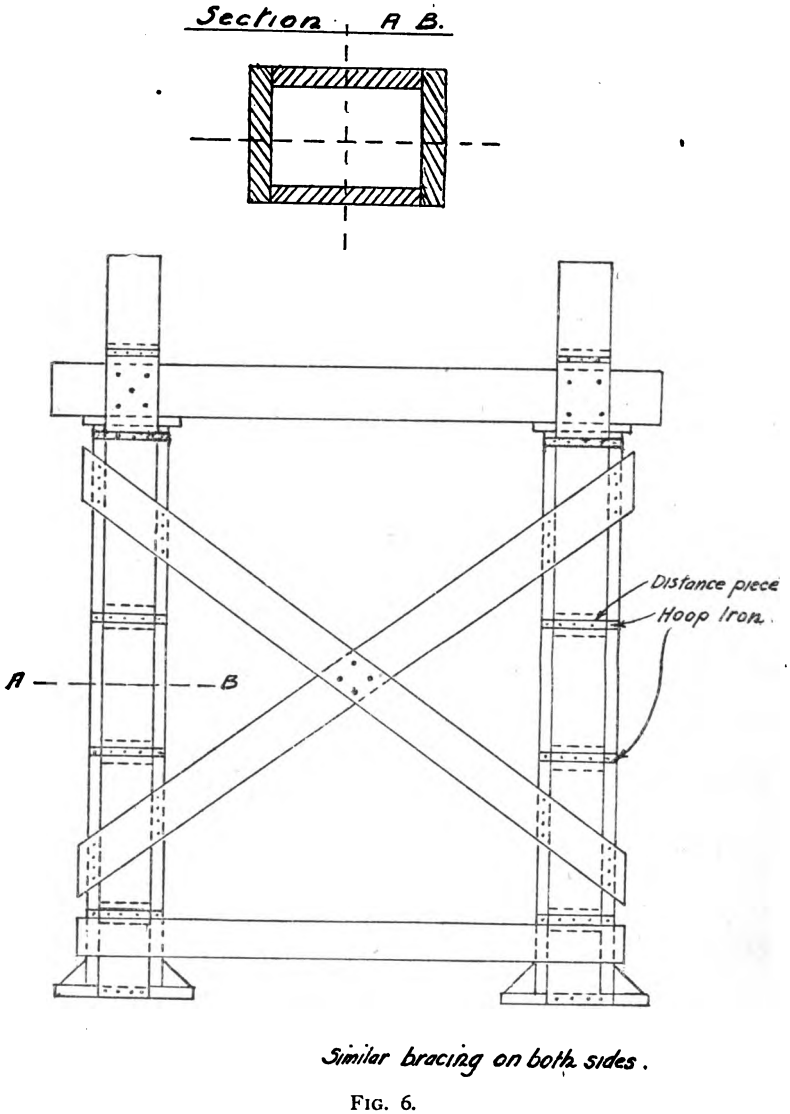


FIG. 6.

If this is made as shown in the sketch with the planks well nailed together, and with distance pieces and hoop-iron bindings at intervals, we may estimate the load as follows :—

Considering buckling either in the plane of the trestle, or perpendicular to the plane, we may assume that two members buckle about

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their longer axis of cross-section and two members buckle about the shorter axis of cross-section.

This assumes that some relative sliding can take place between the individual members. In so far as the nails will partially prevent this the leg will be stronger than estimated.

For two planks buckling about the 11-in. axis

$$\frac{l}{d}=\frac{120}{2}=60.$$

From graph $\quad \frac{P}{rA}=0{\cdot}019.$

$\therefore$ load $\quad =2\times 0{\cdot}019\times 1800\times 22$

$=1500$ lbs.

For two planks buckling about the 2-in. axis

$$\frac{l}{d}=\frac{120}{11}=10{\cdot}9.$$

From graph $\quad \frac{P}{rA}=0{\cdot}345.$

$\therefore$ load $\quad =2\times 0{\cdot}345\times 1800\times 22$

$=27320$ lbs.

$\therefore$ total load per leg $\quad =28820$ lbs.

$=12{\cdot}9$ tons.

Trestles similar to those shown in *Figs.* 5 and 6 have been designed and tested for bridges to carry infantry in fours, and also for bridges to carry the 3-ton A.S.C. lorries. They have shown no sign of failure when the bridges have been tested. In both types, the transom can be temporarily lashed in a position higher than required, and its correct height can easily be adjusted after the trestle has been launched and loaded. This is a great advantage when bridging a river with a muddy bottom.

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## *WILSON MONO-RAIL.*

*By* LIEUT.-COLONEL ARTHUR A. CROOKSHANK, R.E

THIS mono-rail was designed by Major Wilson, R.E. (and the design on Figure shows latest improvements).

The rail is of flat or ribbon iron of about $2\frac{3}{4}$-in. by $\frac{1}{4}$-in. section. Wooden beams are placed across a communication trench overhead —about 6 ft. apart. A strap of square iron goes round the beam and has suspended from it, a hook with a split end; the rail (of flat iron on edge) rests in the split ends. The car, which is designed light, consists of a wooden tray just big enough to carry a stretcher case; it will take a load of 200 lbs. as an alternative. The tray is suspended by continuous wire from two pairs of small grooved (or pulley) wheels, by means of round iron hooks.

As far as I know the Wilson mono-rail only exists in one portion of the line in France; the majority of divisions, when they go into this part of the line, make very little if any use of the mono-rail, probably because they have never seen one before, and are frightened of it, and because their experience is confined to the 60-cm. Decauville or 2-ft. gauge light railway

It seems to be a pity that the Wilson mono-rail has not been developed and used more extensively, as it has many advantages (see Specification and Notes, below) over other types of trench railways.

### SPECIFICATION AND NOTES.

The objections to the existing type of Wilson mono-rail are:—

1. The overhead beam is of freak scantling.
2. The iron strap (round the beam), from which the rail is hung is liable to get displaced, and requires frequent attention.
3. It is difficult to get the rails flush at the joint; if not flush, an offset is left, which jars and retards the car, and also makes a noise.
4. Noise is caused by the flange of the wheel striking the bolt-heads of the joint fastenings. Metallic sounds are very objectionable, especially at night.

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In this design, the following changes are introduced :—

1. The overhead beam is of common scantling, and the method of supporting the ends of the beam is improved.
2. The method of carrying the rail is improved and simplified—the strap round the beam is replaced by a hook through the beam.
3. The rail joint is improved—offsets at the rail junction and the brushing of the wheels against the bolt-heads are eliminated.

*Specification for this Joint.*—The rail is sheared longitudinally for slightly more than the length of overlap intended. An overlap of 4 in. is suggested, in which case the strip should be sheared about 5 in. The upper tongue is to be sheared off at a distance of 4 in. from its end. The lower tongue is to be joggled with a displacement equal to the thickness of the strip, at a point slightly over 4 in. from its end. Two holes of ½-in. diameter should be drilled in the centre line of the lower tongue, 1 in. and 7 in. respectively from the end. The two ends of the rail should be precisely similarly treated. Each will then joint correctly with the next. The whole operation of shearing, joggling and marking centres for holes can be done in one operation, and will then give uniformity. This joint can be shortened considerably by reducing the overlay. Theoretically, the strength of the joint should be thereby increased. In practice, however, the shearing cannot be relied upon to give a perfect fit, and in consequence there must be a slight gap in the butt joint of the upper tongues. The stiffness of the joint must therefore depend largely upon the accuracy of the fit of the two bolts, and the further apart these are placed, the less yield in a vertical plane will be permitted by a slight slackness in the fit of the bolts.

This type of mono-rail has very great advantages over other kinds of trench railways :—

1. It is invisible.
2. It can be run all day.
3. It makes very little noise, and that noise cannot be located, and in those parts of the line in which it has been used, it has never attracted enemy fire.
4. The ordinary traffic of the communication trench is not interfered with—both traffics (mono-rail and foot passengers) can go on at the same time.
5. It is economical in power—one man per car is ample The car carries one stretcher case or 200 lbs.

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6. The rail can be carried round practically any curve—*e.g.* it goes round traverses with 90° corners.
7. Both the line and the rolling stock are very light, also cheap in initial cost and in maintenance—damage and wear and tear are slight.
8. Being in a trench, it is difficult for the enemy to observe artillery fire directed at it.

The usual type of trench railway, viz., 60-cm. Decauville, has none of the above advantages.

Outside the trench area and in other places the Wilson mono-rail can be run overground to connect underground mono-rail base with lorry-head or broad-gauge railhead. (See design entitled Wilson Mono-Rail Overground Type).

Overground type is explained in the Specification and Notes.

The designs are almost entirely by Major A. C. Finnimore, R.E.

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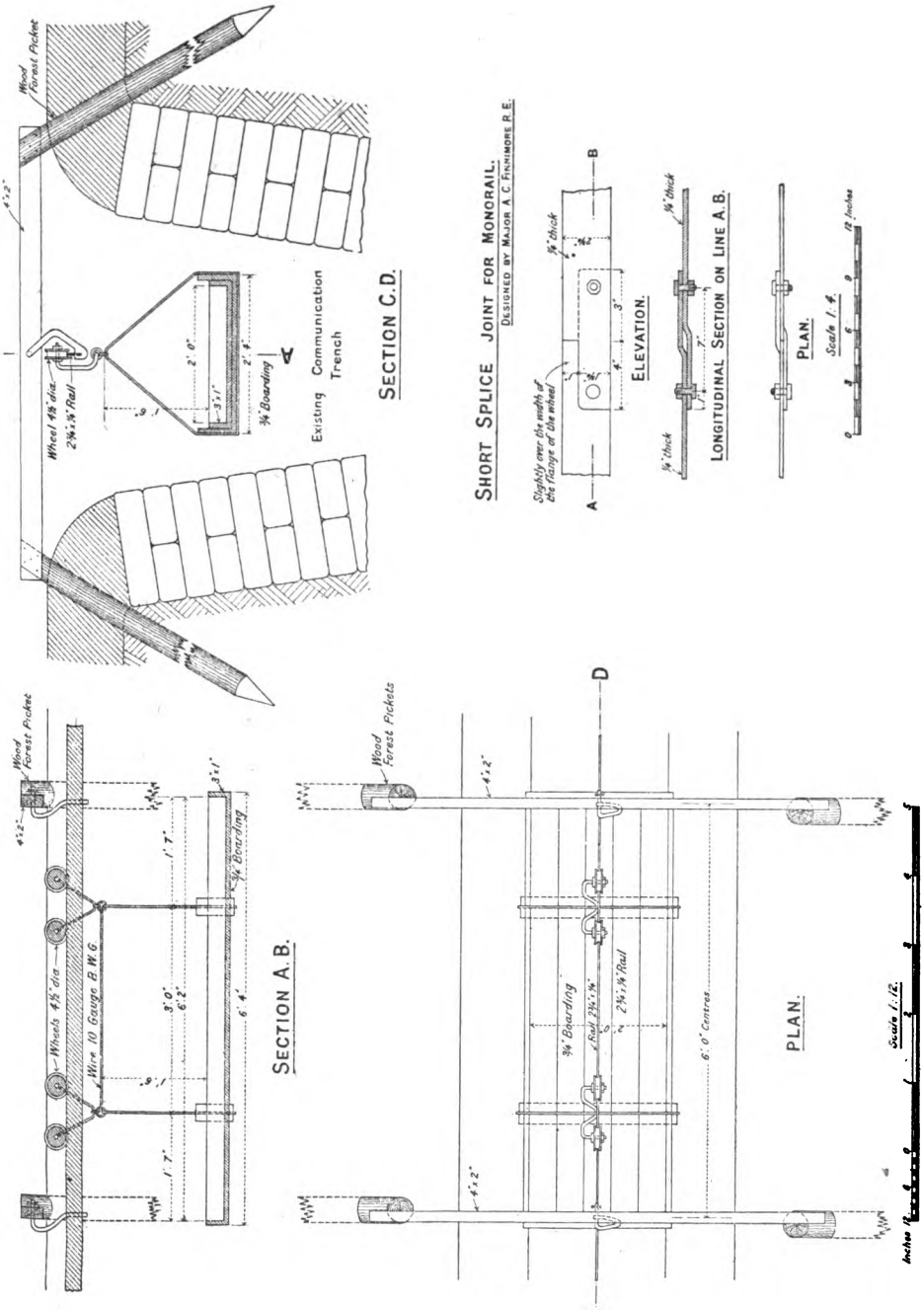
## WILSON MONO-RAIL.

### Improvements designed by Major A. C. Finnimore, R.E.

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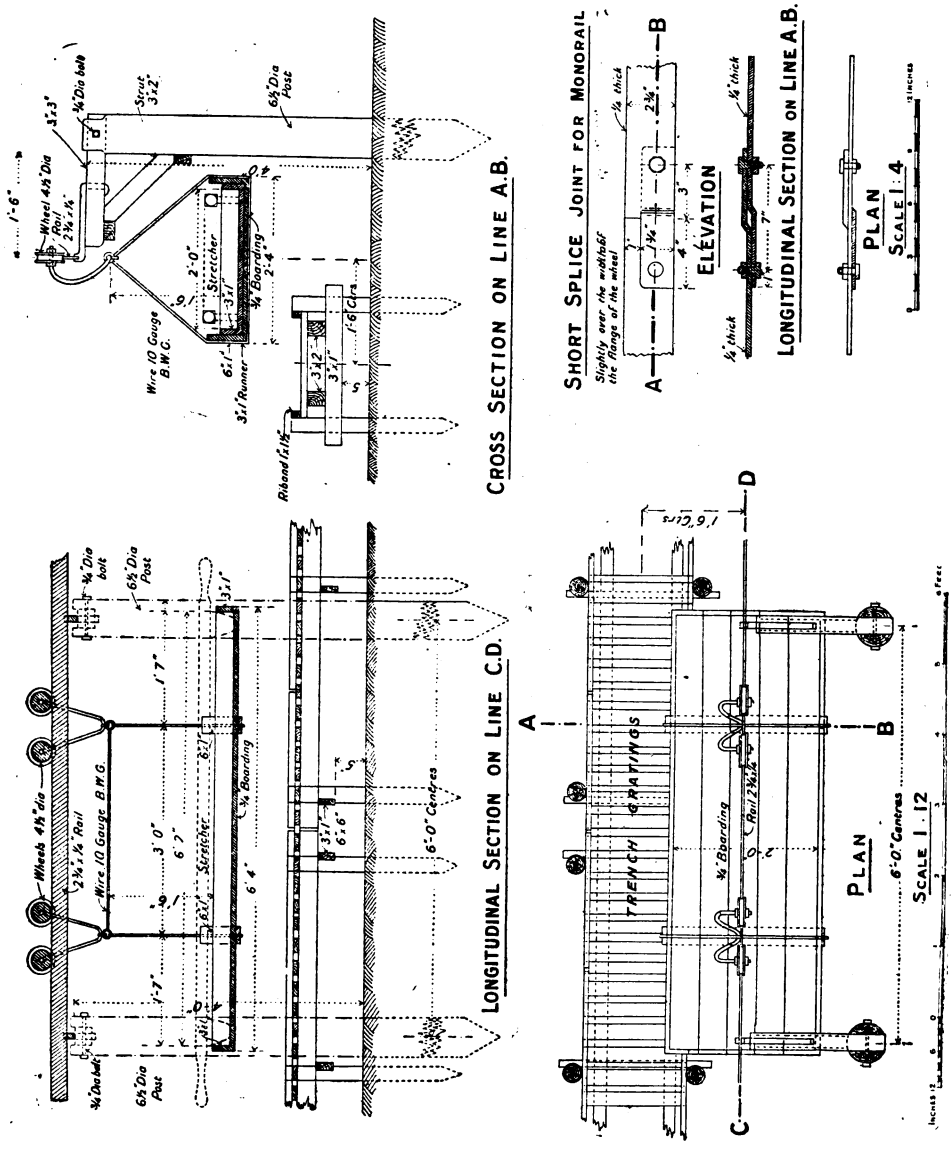
## WILSON MONO-RAIL, OVERGROUND TYPE.

Designed by Major A. C. Finnimore, R.E.

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## *THE BATTLE OF JUTLAND.*

H.M.S. "REVENGE," *29th November*, 1916.

I THINK we saw as much of the Jutland action as anyone in the Grand Fleet. Our squadron was closest to them and we undoubtedly got the best view that the weather conditions allowed, though, of course, we didn't see as much actual fighting as the battle cruisers. Such a lot has been written of the show that I don't suppose I can improve upon it, but perhaps my own impressions might be interesting. We were steaming furiously towards the scene of action and gun-fire could be plainly heard when suddenly a line of ships appeared out of the mist on the starboard bow, which turned out to be our battle cruisers. We could see splashes 100 to 200 ft. high falling alongside them and they themselves were banging off pretty hard. Of the enemy we could see nothing although the B.C.'s were only about 4,000 yards away. They passed across our bow pretty rapidly as they were going 25 knots. Almost immediately we deployed to port and proceeded to look round for the enemy, but could see nothing but a line of heavy flashes that rippled down their line, the leading ship appearing to be just abaft our beam.

The 1st C.S., led by *Defence* and *Warrior*, were now chasing a German light cruiser back towards the line of flashes, but when about 3,000 yards inside our line they suddenly came under a most devastating fire and turned and began to close our line evidently with the intention of passing under the stern of the last ship of the line. At times they were literally obscured by a solid wall of water reaching above their mastheads, out of which would emerge a bow and then a bridge and so on. When she reached a position about abreast of and 1,000 yards from us the *Defence* was sunk. When the smoke cleared away there was absolutely *nothing* left. The same happened to the *Queen Mary*, for 30 seconds after she sank the *Tiger* steamed through the cloud of smoke and steam without touching or seeing a thing.

For 10 minutes or so more we saw nothing but the flashes from their guns and then a few shadowy forms emerged out of the fog for short intervals during which we opened a slow fire, but I don't think with much result.

Being at the rear of the line we could not of course tell much of what manœuvring was going on, but I believe that we were at this time endeavouring to turn their van. When this sort of pot-shotting had been going on for about 20 minutes they disappeared completely and we seized the opportunity to turn in divisions towards them. As

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we did so the *Marlborough*, our next ahead, was torpedoed. I happened to be watching her at the moment. I thought she was going for a moment, but she recovered herself and remained with about 7° of list on.

Six minutes afterwards nine Huns suddenly came into full view. I know it was nine because I counted them, but where the remainder were I don't know. Anyway we got to work on them at a range of about 10,000 and were soon rewarded by heavy bursts of flame which accompanied the hits. The fire appeared to be chiefly concentrated on their leading four or five ships and these must have had a nasty time as for the next half-hour they were continually surrounded by a cloud of smoke from fires, etc. The leading ship, whom we could naturally see best, was, at the end of 20 minutes, only firing her fore turret while the rest of the ship was continually bursting out in flames. It was a most gorgeous sight.

Personally I thought that one of the others blew up, but the visibility was not good enough to tell for certain. They had a few smacks at us during this time, but bar a few chunks of iron from short bursts, which came on board, we were not touched.

They stuck it out for half an hour and then under cover of destroyer attacks and smoke screens bolted. Even then, being the faster fleet, I don't quite see why we should have lost them, but although I have heard a lot of argument about it I have never really discovered the reason.

Anyhow, lose them we did and night was quickly on to us. All through the night we steamed south with the fleet, but, as the damaged *Marlborough* was leading our sub, we slowly dropped astern of the rest. This we didn't know at the time. Three during-the-night attacks took place on big ships quite close to us and some very pretty fireworks there were too—searchlights, guns and cordite fires on board the attacking destroyers, and on one occasion the whole sky was lighted up as a big ship blew up some way astern. These we imagined to be the Hun destroyers attacking one of our other squadrons. Little did we realize that it was the High Sea Fleet being attacked by ours. However, nothing came near us and when daylight came there was a thick fog. Early in the morning the *Marlborough* was sent off home and the Admiral transferred his flag to us. Shortly after he arrived we sighted a Zepp and had a shot at it. As a matter of fact we fired two salvoes, but unfortunately without getting a hit. Still, it scared her a bit as she didn't wait for a third, but pushed off at full speed. Funnily enough, however, the aforesaid salvoes went careering off into the fog and fell about 300 yards off one of our own battleships 15 miles away. That was the last shot we fired and it really ended our warlike adventures as there was nothing left to do but return, the Huns being undiscoverable, and we sadly wended our way back North.

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# *REVIEW.*

## PAGES D'HISTOIRE, 1914—1917.

(Librairie Militaire Berger-Levrault, Paris: 5, Rue des Beaux-Arts).

*Continued from R.E. Journal for July, 1917.*

The 129th number of this series is entitled *La Manœuvre Allemande* and deals with the peace-kite sent up by the German Government in the winter of 1916. The contents of the volume are grouped in seven sections and consist of the texts of certain official documents and of the speeches delivered in connection with the attempt of the German Kaiser to secure a German peace. The volume is provided with appendices (under five heads), containing extracts from Press articles published contemporaneously with the initiation and failure of the German Government's efforts to secure its ends. These contents are preceded by a Preface written by Monsieur Georges Reynald, Senator for the Ariège and Secretary to the Commission for Foreign Affairs. In this Preface Monsieur Reynald summarizes the situation in the light of the documents, etc., connected with the German Kaiser's peace manœuvre. He points out that the concluding weeks of 1916 and the opening ones of 1917 were accompanied by the outpouring of an enormous volume of diplomatic correspondence, *e.g.*, the German Note, containing the offer of an illusory peace; the intervention of President Wilson, calling on the belligerents to declare their war aims; the reply of the Central Powers to President Wilson, amounting to a refusal to discuss the situation; the reply of the Entente Powers, which, whilst maintaining a firm and courteous attitude towards the President of the great American Republic, provided a dignified and spirited answer to the peace manœuvre of their enemies; the irate rejoinders of the disappointed Germanic States, ending in the announcements from the Wilhelmstrasse and the Ballplatz of their intention to prosecute unrestricted submarine warfare, acts resulting eventually in the rupture of friendly relations between the United States of America and Germany.

The correspondence referred to may, Monsieur Reynald points out, be studied with profit; it represents, so to speak, the heavy artillery of the several Chancelleries in action, an action of such intensity as to have exhausted the supply of ammunition in its parks. Public opinion was, at first, much disturbed by the opening shots; it was shaken by the shock and explosive wave arising from the comments in the Press that followed; later, the public regained their composure, and the texts of the documents published were examined with a view to ascertaining the nature of the arguments, in support of their respective propositions, used by the several parties concerned.

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Monsieur Reynald justly claims that in this respect France and her Allies were certain to win. The Entente's case rested on logical reasoning and was presented in unambiguous phraseology. The confident calmness and frankness shown in the Entente's reply is in marked contrast with the equivocation and reticence apparent in the German documents, etc.; the latter seem to have been designed solely for the purpose of creating a favourable impression.

In order to render the study of the diplomatic correspondence in question profitable to the fullest extent, it is necessary to place the texts of the several documents in their proper sequence, and this is what the editors of the volume under review have endeavoured to do; they have collected between two covers all the depositions in the case. This collection unfolds the elements of a veritable drama, such a one as not even the most ancient of theatres has seen staged. The scene is one of the vastest that can be conceived, it extends across the Old World even unto the New; the plot concerns itself with the answer to the question whether the War, which is engulfing Europe and claiming thousands of victims daily, shall be prolonged or shall be brought to an immediate termination; the *dramatis personæ* are none other than whole nations, who like the heroes of the tragedies in the ancient classics, are resorting, in giving expression to their sentiments, to the similar practice of taking the whole world into their confidence. In the first act in this game, says Monsieur Reynald, Germany plays the leading part. She struts on to the stage encased in armour, wearing a visored helmet and with a drawn sword in her hand It is Germania, the warrior, whose stalwart figure the Teuton loves to parade, that appears behind the footlights. She stands erect, the point of her drawn sword resting on the ground, her hands on its hilt; she endeavours to provoke her adversaries to make peace, much in the same way as she provoked them to make war.

In her declamation can be traced a mixture of hypocrisy, haughtiness and violence. Her words make mention of humanity being struck a deadly blow in the most precious part of its heritage, of the material and moral progress of Europe lying heaped up in ruins. Then casting a satisfied glance on her own form and figure, she lauds her own vigour and power exultingly. The phrases ring out: indestructible force, military successes, unbreakable lines. To Germania the victory, to others the responsibility for the War. 'Twas not she who was the instigator of the Great Conflict; the necessity of securing her national existence against the ambitious designs of her neighbours compelled her to fly to arms; she has now, and always has had, the deepest respect for the rights of other nations.

To show the intense amicability of her disposition Germania is willing to exhibit extreme moderation in utilizing the fruits of her Great Victory. She could utterly crush her enemies and completely annihilate them; but she prefers to invite them to formulate peace proposals, making the reservation alone, that the honour and free development of Germany shall be duly provided for. Lest her adversaries may not make haste promptly to accept this magnanimous offer, it is intimated that a refusal on their part will arouse the very depths of the anger of

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the Germanic nations, and this will result in bathing the recalcitrant Entente Powers in a higher tide of blood than that of previous springs.

Very different is the manner of President Wilson's entry on to the stage; there is no blustering either in his speech or in his manner; he no longer wears the picturesque garb of Uncle Sam, so familiar in ages past. Mr. Woodrow Wilson, says Monsieur Reynald, is a modern American; he comports himself with dignity and correctness. His character is composed of the two contradictory elements, for which his compatriots are noted: practical sense and spiritualistic tendencies. This combination of realism and idealism is a result of the conditions under which the American nation has grown up. Immigration has played a very considerable part in building up the American nation. The immigrants were men possessing the spirit either of adventure or of enterprise; they were animated with the desire of obtaining material prosperity and of seeking in an enlarged outlook some compensation for their exile. They took with them to their country of adoption the qualities of goodwill, energy and initiative; to these qualities is it due that the United States of America has reached a very high level in the sphere of economic power.

Emigration, Monsieur Reynald points out, is rarely a spontaneous movement; it has frequently its origin in political unrest or social upheavals. Fugitives and the outlawed labour under a sense of violated rights and of injustice suffered and, on leaving their native soil for distant lands, resolve to establish in the latter a more equitable code of justice and a wider range of liberty than that prevailing in their own homeland. The New World was impregnated by the colonists, who first settled on its Atlantic seaboard, with the virtues of Puritanism. In this environment the business life and commercial activities of the American people have descended from one generation to the next as a patrimony, in which ideals have ranked high.

The President of the United States, who is a professor and a jurist, naturally gives due weight to the theoretical considerations governing a problem, and he expresses himself accordingly with the serenity of a philosopher accustomed to act on first principles. His language is that of a magistrate, nay even that of a judge. It is palpable that he has exercised scrupulous care in maintaining absolute impartiality, that he has rigidly avoided giving expression to his own personal views on the situation.

No one can be unmindful of the part America has played as the Universal Provider of the Armies of Entente Powers during the War; a part whereby her people have been enormously enriched. Maybe, says Monsieur Reynald, President Wilson may have thought that his countrymen were becoming too prosperous just now and that it was necessary, in consequence, to put on the brake on the too rapid growth of wealth, lest this should give rise to a situation likely artificially to modify, and thus upset, the economic equilibrium of the State. The President may further have anticipated that some danger existed also of the financial resources of the Powers that had become debtors of his country becoming exhausted. The fact stands out that Mr. Woodrow Wilson is a statesman of great capacity.

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There remains to be considered the part played by that other group in the Cast: the Entente. She also is wearing the harness of war, and blood is flowing from her wounds. But she stands upright and faces her audience with a proper pride; her robust appearance indicates that she is not inferior in vigour to massive Germania, and the opening words with which she introduces herself to her audience strikingly exhibit her moral superiority over that of the first actress that appeared on the stage. Having to make a twofold reply, the modulations of her voice vary according as she is addressing the first or the second of her interrogators, but one and the same idea continues to pervade her entire dialogue. Turning first to her aggressor, she indignantly refutes the erroneous assertions contained in the German note. With dated documents in her hand, she conclusively shows that it was the Teuton that decided to plunge Europe into a War; there is no difficulty in exposing the imposture. She vigorously denies that victory has been won by the Germanic Empires; it is because they see all chance of success disappearing that they have taken hurried steps for the purpose of securing peace. She is not to be easily duped, she perceives that the peace offer is but a decoy. The innumerable crimes committed by Germany and her Allies demand the infliction of punishments and compel the Entente to demand guarantees for future good conduct. It is easy to see through the Teutonic game, Germany seeks to disturb the relationship of the Allies, to encourage the faint-hearted amongst her own people, to intimidate Neutrals in order to justify a resort to further crimes more abominable, if that were possible, than those she has been guilty of hitherto. Its very insincerity makes it impossible for the Entente Governments to consider the Teutonic proposition. It is emphatically announced that the only peace with which the Entente Powers will be satisfied is one which provides reparation for the rights and liberties violated, the recognition of the principles of nationalities and of the free existence of small States. At the same time it is clearly stated that causes tending to put the security of nations in jeopardy must be effectively eradicated.

Addressing President Wilson, the Entente acknowledges the purity of the sentiments with which he is inspired. She is animated with the same desire for peace that he is; she also wishes to see the creation of a League of Nations whose duty would be to ensure Right and Justice throughout the wide world. But a durable peace can only be brought about by securing a suitable decision in the present conflict; since the responsibility for setting this conflagration ablaze rests on Germany's shoulders, punishment must be meted out to her. All the wrongful acts witnessed have been Germany's doing, and Neutrals must alone blame her for all the sufferings caused them by the War. It was but necessary to recapitulate briefly the facts relating to the incidents which preceded the War to establish, without any possibility of contradiction, the intentional aggression committed against the Entente Powers by Germany and Austria-Hungary.

Having made the above preliminary observations the Entente declares herself ready to reply to the question put by President Wilson. She experiences no difficulty in doing so, for her war aims are already known

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and have been announced openly on several occasions. Without pomposity or boasting, she again proclaims the noble and grand programme she has laid down wherewith to crown her efforts when success finally is assured to her arms: restoration of the territories of the Small Powers devasted by the enemy, evacuation of the invaded provinces, restitution of regions taken by previous acts of violence, liberation of oppressed peoples, in a word her war aim is to bring about a reconstruction of Europe on lines which will provide a sufficient guarantee to ensure a stable peace in the future and the free economic development of the European nations. It is to secure these ends that so many and great sacrifices have been suffered.

Monsieur Reynald next seeks the secret springs, hidden behind the scenery, which have been actuating the machinery brought on to the stage. What was Germany's motive in coming forward as the herald of peace? And why at the particular moment chosen? The replies to these questions are by no means simple to frame; the duplicity of Germany tends to complicate the terms to be employed in the answers. "Berlin," says Monsieur Reynald, "has not involved itself in such an adventure without having first carefully weighed the *pros* and *cons*, without having turned over all the hypotheses and without having clearly in view the ultimate consequences of the step taken." He expresses the opinion that Germany was animated with a real desire to obtain peace, and this for extremely sound reasons. The course taken by the War has been widely different to the one that the German nation persuaded itself to anticipate, and their hopes have consequently been bitterly disappointed. The Great General Staff thought that it had considered every contingency and that it had succeeded in making complete arrangements to meet them all. It was imagined that the campaign would be short and brilliantly successful; a few weeks alone would suffice in which to woo Nice, the goddess of victory, to win her, and to lead her to the Teutonic camp as a laughing bride. In consequence, the German Mars started off light-heartedly on his errand to court the goddess; no one in Germany doubted for a moment that the sedulous care which had been taken to prepare the way to win her affections would fail to achieve the purpose in view; minuteness and method were the accompaniment to the Teutonic love song. The harmony, it was expected, would be perfect. But Nice proved obdurate, she was not prepared to accept the advances of this suitor. Many months slipped away and she still continued to refuse to fall a victim to the Teuton's wiles; there now seemed to be little hope of causing her to change her mind. The disappointments met with in this courtship have adversely affected the German nation in other fields also; German commerce, hitherto so prosperous, is paralyzed, the economic life of the Empire is at a standstill, mourning is spreading far and wide over the Fatherland, and serious discomfort and inconveniences have to be faced at every hearthside. The courtship upon which the German nation entered, instead of providing it with a richly dowered bride, has brought for its people nothing but sadness and ruined hopes. That which was to have proved advantageous to the nation now turns out to be a heavy and onerous burden. Public opinion in Germany has

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become weary, and discouraging symptoms have taken the place of the enthusiasm which burst into ebullition in the first days of August, 1914.

Germany further recognized the fact that, since the Entente Powers were not smashed by the first shock of her assault, they are now able to develop their latent strength to its fullest capacity. Meanwhile, Germany herself is far from being inactive or resigned. She has indeed surpassed herself and is striving to prepare herself for a supreme effort to turn the tide into channels which will spell success for her; she has concentrated her attention on everything imaginable likely to be of service to her; she is inventing new foodstuffs; she is increasing enormously the output of her factories; she is unceasingly improving her artillery and increasing the number of her guns; she is multiplying the number of her submarines; indeed, in all domains affecting military operations, she is making the most prodigious efforts; but at the same time the Entente Powers show no less activity. France, instead of becoming weaker and disheartened, as the German psychologists persuaded themselves, and had also taught their compatriots to believe, would be the case, remains unconscious of any feeling of exhaustion, indeed her sons are redoubling their deeds of heroism; Great Britain, breaking with all old traditions, has become a nation in arms and has performed miracles in the matter of raising armies and equipping them for War; Russia in the East and Italy in the South are both working in the same spirit as their Western Allies and are compelling the Central Empires to employ their forces on extremely extended fronts.

Can it be wondered then that, under the circumstances then existing, a feeling had grown that it would be well for Germany to finish with an adventure which had miscarried and whilst it was not yet too late for her to obtain some profit therefrom, in spite of the partial failure of her great designs. The War map, at all events, was bringing some comfort to her people, and if deductions as to the nature of peace terms could with certainty be based thereon, their expectations might reasonably be of an optimistic rather than of a pessimistic kind.

The German nation unquestionably wished for peace, but for a peace in which its own interests alone would be served and safeguarded. However, for the German proposals to be acceptable to her adversaries and to receive serious consideration, it was indispensable that the Chancellor at the Wilhelmstrasse should formulate his offer in very precise terms and should at the same time adopt a conciliatory attitude. The Imperial Chancellor acted, however, on directly contrary lines; he displayed considerable reticence and also attempted to bemuse his adversaries, and the world at large, with equivocations. Monsieur Reynald points out that it is not necessary to be a wiseacre to realize that Berlin had not, in making the offer of peace, renounced in the slightest degree the extreme limits of its domineering ambition, and that what was offered under the euphemism of peace was but that condition of existence which others have labelled *servitude*. Germany has been the victim of her pride and of her bluff, she has placed herself in a cleft stick from which she will find it difficult to extricate herself. She has exaggerated the extent of her victories; she has stimulated the expectations of Pan-Germanists; she has enlarged upon the rights and future of the Teu-

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tonic race ; she has heralded the apotheosis of a still Greater Germany than that of 1914. She finds it difficult now to save face ; and the Imperial dynasty desires to avoid the dangers to which it would be subject in the event of a termination of the War without some compensating advantages to the German masses, who have borne the burthen of the War, exasperating them to such an extent as to cause them to turn against those who must be finally held responsible for all the sufferings and misfortunes that have overtaken them.

Monsieur Reynald points out that however obtuse its psychological instinct may have been, nevertheless the Wilhelmstrasse had distinctly foreseen that its attempts to secure the peace it was seeking would most certainly have met with failure had the German war aims been disclosed in their true and hideous colours. It was expected that the chances of securing the end in view were greater if the magic word *peace* could be dangled before the world to act as an enticing bait wherewith to hook an unwary belligerent.

The Teutonic calculations proved false. The *manœuvre* distinctly displayed considerable ingenuity, for Germany in no way committed herself ; she arranged that she should hold all the trump cards in her own hand. The ruse was well contrived, at least, so it was thought in Berlin. Germans do not readily renounce the error of their ways. The licensed intellectuals of the Empire had decreed that France was incapable of carrying on a prolonged war ; her sons did not possess a genius equal to that of the Germanic peoples. Facts which daily and hourly are contradicting the doctrines preached by the Teuton professors, have not yet upset the faith of the Germanic peoples in their teachers and leaders. It continues to be thought in Germany that there is some weak place in France's armour which can be enlarged into a fissure of sufficient size to enable the decisive stab to be struck through it. It was hoped that the peace offer would throw so bright an illumination on the figure of France as to lead to the discovery of this weak point in her armour. It was known that there was a section of the French people that was eager for peace ; it was on the cards that the old quarrels between the several parties in France might be renewed and that pressure might be brought to bear on the Government by those blinded by false appearances. In this event, the infection might spread to others of the Entente group ; a powerful pacifist clique had existed in Great Britain in former times, its members might possibly be aroused from their torpor by the alluring German offer ! There was want of unanimity in war aims in Italy also. Finally, there were those in Russia who, for many reasons, would be inclined to listen favourably to a proposal promising peace. Germany might yet obtain by diplomatic means, so it was hoped, the victory which had escaped her grasp on the blood-stained fields of war. In this, as on a former occasion, she deceived herself and her illusion was of very short duration. The answer to Germany's cunning manœuvre is to be found not alone in the collective note of the Entente Powers, but in the hurricane of indignation of the people of the Entente group, which spontaneously swept the treacherous peace offer into the cloud of things unacceptable ; the halls of the legislative assemblies in every Entente country resounded with the ener-

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getic and vigorous rejection of the proposal. The impudence with which Germany began the War, her contempt for treaties, the cynicism of her people, at a time when the German armies were temporarily in the ascendant, were recalled with vividness. How could Germany dare to undertake the safeguarding of the interests of civilization? By what title or right did she claim to speak of conciliation and of peace? Could any confidence be safely placed in her? These were some of the questions asked to which reliable answers were sought.

The rebuff that Germany met with, says Monsieur Reynald, must have been extremely disconcerting to her; it is always an unpleasant experience when some particularly smart trick, of which one is the inventor, fails to come off. In the case of the German peace offer the failure was particularly galling in view of the fact that the manœuvre was intended to deceive not only the Entente Powers, but also Neutrals; aye, even the whole of the Teutonic race in addition.

Neutrals were by no means without a stake in the situation, and this had been fully recognized by Germany. One has only to recall the patience and tenacity shown by German agents in their attempts to manage public opinion in the United States; the Wilhelmstrasse has at least endeavoured to persuade President Wilson that much importance was attached to the views of his government; Von Bülow and a whole host of Teutonic underlings had been haunting the German Legation at Berne for months with a view to creating the impression that considerable value was attached to Helvetic sentiment. Finally in Spain too, to refer only to one other of the Neutrals, a vast amount of propaganda work had been done with a view to sow the seeds of Germanophilism. How is it, the question is asked, that none of these Neutrals appear to be flattered at being chosen as intermediaries to bring about a state of affairs that will cause the ills they have been suffering from the War to come to an end? The answer will be found later.

So far as the docile and confiding masses of the German people were concerned the failure of the manœuvre was not likely to cause the governing classes any serious anxiety. It could always be represented that they were the conquering nation, but that their adversaries obstinately withheld the fruits of the successes won, and were firmly resolved to seek the ruin and destruction of the Germanic races. Consequently, the Entente people merited neither compassion nor mercy at the hands of the Teutons who should therefore brace their energies and consecrate all their resources to obtain one end, a crushing German victory. Hate thrives particularly well on German soil, and the prospect of seeing Entente innocents fall victims in the Great Conflict would momentarily console the Teuton for the sacrifices he would himself have to make.

Neutrals naturally formed their judgment on the situation with little or no bias. War is hard on all alike and Neutrals cannot escape from its toils. So that when Germany began to seek for pretexts to justify "frightfulness" of a novel and atrocious kind that would cause added sufferings to Neutrals and belligerents alike, she raised against herself every Power who had an interest that could be injured, and in consequence, powerful and legitimate protests were raised in every quarter of the globe.

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The United States of America had already defined her attitude and had claimed to be qualified to speak in the name of right and humanity. President Wilson was not to be cajoled into surrender of his opinions by any hocus-pocus conciliatory proposals. He wanted a plain answer to a plain question. Hence it was that the anger of the German people rose to white heat. A short and sharp answer was given by the Wilhelmstrasse and President Wilson was made to understand that his intervention was considered inopportune and that Germany was not prepared further to pursue the matter of the offer she had made.

Germany has as many War aims as she has enemies. She has from the beginning hoped to sow dissensions in the Entente camp and thus to divide its members by indirect and secret intrigues. She still retains the hope that she will succeed in doing this and then make a separate peace with each of her adversaries. She has had the chagrin to see her "*offensive diplomatique*" suddenly crumble away. To announce to Neutrals her intention of making her promiscuous submarine warfare was indeed something that required delicate handling. Had Germany put forward more plausible arguments than she did, it is probable that she would still have failed in her attempt; but, being caught in her own trap, she has lost all authority and to-day finds herself utterly discredited. No longer able to persuade, Germany has taken refuge in wild anger and manifestations of extreme violence.

Wilhelm II., no longer able to contain himself, launched out on the 12th January, 1917, with a bellicose proclamation to his people; the pacifist of yesterday became the frenzied apostle of destruction; he even found it necessary to antedate to the preceding October, a letter addressed to the Imperial Chancellor, and satisfied his personal vanity, says Monsieur Reynald, by sandwiching this period of diplomatic activity between two acts emanating from his brain and between two documents bearing his signature.

Germany has been baffled; she deceived no one and is still saddled with full responsibility for her misdeeds. She has slunk back into the crooked paths she has been following for so long. She is defying the whole world and playing the pirate on all the sea routes. The great American nation has ceased to utter vain protests. President Wilson, acting on behalf of his compatriots and as a true interpreter of international law, has made known the judgment of the American people; a judgment which contains the condemnation of a cruel, rapacious and treacherous Power.

Such has been the end of the *Manœuvre Allemande*.

The following brief summary of the documents, etc., in the volume under review may prove of interest;—

Section I. opens with the text of the Kaiser's letter dated 31st October, 1916, addressed to "My dear Bethmann." This letter is followed by the text of the radio-telegram sent out from Nauen on the 12th December, 1916, announcing that the Imperial Chancellor had placed the now famous Note, containing the German peace offer, in the hands of the diplomatic representatives at Berlin charged with the task of looking after the interests of the Entente belligerents. Next follow the text of the Note in question; the Imperial Chancellor's speech in the Reichstag

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dealing with the situation; the German Note to the Pope; the telegram sent by the Austro-Hungarian Government on the 12th December, 1916; the orders issued, on the date last mentioned, by the two Kaisers to their own armies respectively; the statements of Baron Sonnino and of Monsieur Briand made, on the 13th *idem*, in the Italian and in the French Chambers respectively; the statement of Tisza made, on the 14th *idem*, in the Hungarian Chamber; the Russian Note (in reply) issued on the 15th *idem*; statements of the British Prime Minister and of Mr. Asquith made, on the 15th and 19th *idem*, in the Commons.

Section II. opens with the text of President Wilson's Note of the 21st December, 1916, to the belligerent Powers; it is followed by the Swiss Note of the 23rd *idem* to the same Powers, and concludes with the manifesto of the Czar to his Army and Navy (issued 25th *idem*).

Section III. contains the text of the replies of Germany and Austria-Hungary to the American Note and also the text of their replies to the Swiss Note, all four bearing the same date, viz., the 27th December, 1916; then follow the Spanish Note to President Wilson and the Note of the Scandinavian States to the Entente Powers (both dated 29th *idem*).

Section IV. is devoted to the reply of the Entente Powers to the Central Empires (dated 30th December, 1916).

Section V. contains the texts of the reply of the Entente Powers and of the Belgian Note addressed to President Wilson (both dated 10th January, 1917).

Section VI. contains the texts of the second Notes to the Neutrals by Germany and by Austria-Hungary (both dated 11th January, 1917); Kaiser Wilhelm's proclamation to his people (dated 12th *idem*); the British Note to President Wilson (dated 16th *idem*); the texts of the replies of the Entente to Switzerland and to the Scandinavian Powers (both dated 17th *idem*); the text of the Bulgarian reply to the Entente Note (dated 21st *idem*).

Section VII. is devoted to the message sent to the American Senate, on the 23rd January, 1917, by President Wilson.

The Appendices contain extracts from the American and Continental Press covering the following periods:—

I. That succeeding the issue of the first German Note.

II. That succeeding the statements made in the Entente Legislatures in relation to the German Note.

III. That succeeding the issue of the American Note.

IV. That succeeding the definitive reply of the Entente Powers to the Central Empires.

V. That succeeding the definitive reply of the Entente Powers to the American Note.

The 130th number is entitled *Les Sous Marins*, and consists of seven chapters contributed by Monsieur J. Hutter, Engineer-in-Chief of the French Navy.

Chapter I. of the volume is devoted to the "History of Submarine Navigation." The progress of science, Monsieur Hutter points out, has enabled man in recent years to explore regions which, in former times, was reserved exclusively for the use of the fish species and of the winged creatures of the air. A close similarity exists in the problems

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connected with aerial flight and submarine navigation; aircraft and U-boats both direct their courses in fluid media and possess the valuable quality of being propelled in spaces of three dimensions. The engines which supply them with the necessary power have, however, motions in but two dimensions. A close study of the theory of the two kinds of craft in question discloses the fact that in matters connected with buoyancy, steering and stability the requirements as to the means and machinery to provide for these qualities are identical in the two cases.

The success of the first aeroplanes was due, as is well known, to the work and experiments of the two American brothers, Wilbur and Orville Wright, in 1908; it is less well known that the first U-boat was also of American design, being invented by Robert Hudson, of Pennsylvania, in 1797. Fulton was considerably in advance of his times; steel constructions had not been thought of in his day and therefore the hull of his U-boat was built entirely of wood, and the muscles of human beings directly provided the power necessary for the submersion, propulsion and steering of his craft. Many details concerning Fulton's U-boat will be found in the volume under review. The next step in advance was taken by two Frenchmen, Admiral Bourgois and Charles Brun, the engineer; their work too was premature, as suitable machinery for causing U-boats to submerge had not yet been invented. However, the original U-boat, the *Plongeur*, built at Rochefort in accordance with their designs, is still in existence, being in use as a reservoir ship. The characteristic feature, and one to which its want of success was due, consisted in the use which was made of compressed air for its propulsion. The idea was good and was later utilized by Whitehead for driving his auto-torpedo; but a torpedo is a small thing compared with a U-boat. The space required and the weight of the compressed air cylinders was very considerable in the *Plongeur*, and, even so, the craft could only be given an extremely small radius of action. The great defect in the *Plongeur*, however, was the fact that the air exhausted from her engines could not be got rid of without betraying her whereabouts and disclosing her track. The *Plongeur* also suffered under the disadvantage that she was not provided with a periscope. She was, however, provided with a specially designed lifeboat. This lifeboat was housed in a hollow space in the upper part of the *Plongeur's* hull; into it the crew could climb. So that in the event of any mishap to the U-boat, which might prevent her from rising to the surface, it was possible for the crew to take refuge in this lifeboat; after having closed the water-tight doors the crew could unfasten the bolts which held the lifeboat to the U-boat. They could in this way escape from their submerged prison-house.

It was not until dynamo-electric machinery and electric storage batteries were invented that it was possible to make any real progress in the construction of U-boats. France led the way to further improvements by the construction in 1890—1892 of the *Gustave-Zédé*; this boat was entirely an electric submarine and had a speed of 9 knots submerged. The construction of U-boats proceeded apace in France; the progress of technical knowledge was taken advantage of and many improvements were introduced. The invention of the periscope took

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place about this time and added enormously to the value of the new weapon of naval warfare. Laubeuf now appeared on the scene and designed the submersible, of which the *Narval* was the prototype; he revolutionized the construction of submarines. Two difficult problems were solved by him; one connected with the motive power, the other with the design of the hull. Electric storage batteries by themselves are too heavy to give a U-boat a sufficiently wide radius of activity. By providing for the coupling of specially designed liquid-fuel steam-engines and also electric storage batteries on to the propeller shafts, Laubeuf solved at one stroke the problems connected with the economical propulsion of U-boats on the surface of the water, and those connected with their rapid submersion and propulsion under the water.

The problem connected with the design of the hull of the U-boat he solved, by the provision of an inner and outer shell. He endowed the hull simultaneously with the form best able to resist the hydrostatic pressure when submerged and with lines best suited to meet the requirements of buoyancy and speed when the boat is travelling on the surface of the water. He provided an inner shell, the transverse section of which was at every point a true circle, and also an outer shell, the lines of which were those of a destroyer. The space between the two shells was utilized for the water ballast used for causing the U-boat to submerge. Much interesting information is given concerning the *Narval* and her first voyage from Cherbourg to St. Malo and to Brest.

The next step in the progress of naval architecture in relation to the design of U-boats was naturally that connected with an increase in their tonnage. Four submersibles were built on the model of the *Narval*, each of 150 tons, and then followed two others each of 175 tons. The two last-mentioned were provided with Diesel oil engines and therefore their design marks a further step in advance. Step by step U-boats became larger and larger and it is recorded that the French Government in a short time built 34 U-boats (18 of the *Pluviôse* and 16 of the *Brumaire* type), each of 400 tons. These boats had a length of 163 ft. 9 ins., a surface speed of 12 to 13 knots, and a speed of 8 knots when submerged. They carried a crew of 26 men.

In a few years France had built herself a superb flotilla of submarines, and in 1906 possessed a distinct superiority in this respect over the other Powers in Europe. Between 1908 and 1910, both the British and German Governments took up the matter of the provision of submarines seriously and large sums were included in the naval budgets of the two countries.

The competition of the various nations naturally resulted in still further technical progress, so that before the present War broke out submarines, having a surface displacement of 900 tons and capable of steaming at 19 knots, had already been constructed. Some of these boats can travel at a speed of 11 knots under water and can remain submerged continuously for 48 hours without having to recharge their accumulators; they possess a radius of action of from 200 to 250 miles on a charge.

Chapter II. is devoted to "The Submarines of the Different Belligerent Powers." Before dealing with the U-boats in possession of these

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Powers, the considerations affecting the employment of submarines are briefly stated. A matter of considerable importance is the speed of U-boats. The main thing to be borne in mind is that by attention to details in design the difference between the surface and submerged speeds can be sensibly reduced. In some cases this difference is as high as 35 per cent., but usually it is somewhere between 25 per cent. and 15 per cent. The most important consideration, however, is the radius of action of U-boats; a matter which is closely bound up with their engine power, and the fuel used. It has to be remembered that by travelling at a speed less than her maximum a U-boat can enormously increase her radius of action; indeed, in the ratio of the square of the reciprocals of the maximum and reduced speeds, *e.g.*, a U-boat with a maximum speed of 16 knots for a radius of activity of 1,000 miles, by halving the speed increases her radius of activity fourfold, *i.e.*, to 4,000 miles.

A high surface speed and a wide radius of action are two qualities which it is difficult to provide for simultaneously in the present-day U-boat. But the use of the Diesel oil engine has helped forward the solution of this problem.

The following is a very brief summary of the information contained in the volume under review concerning the submarines, completed and under construction, in possession of the several belligerents in August, 1914:—

| Country. | No. | Displacement of Largest Submarine in tons. On Surface. | Displacement of Largest Submarine in tons. Sub-merged. | Speed of Fastest Submarine in Knots. On Surface. | Speed of Fastest Submarine in Knots. Sub-merged. |
|---|---|---|---|---|---|
| France .. .. .. | 69 | 870 | 1200 | 19 | 11 |
| Great Britain .. .. | 91 | 550 | 1200 | 20 | 9 |
| Italy .. .. .. | 27 | 700 | not given | 18 | 12 |
| Russia .. .. .. | 23 | 700 | ,, | 16 | 12 |
| Germany .. .. .. | 46 | 700 | 890 | 17 | 12 |

Monsieur Hutter tells us that Great Britain was at first not inclined to take the submarine seriously and therefore did not begin the construction of submarines till somewhat late in the day. But when once she had made up her mind on the subject she tackled the question very thoroughly and bought the best types of these boats to be obtained in the market, so that when the War broke out she had quite a first-rate flotilla of U-boats.

The Italians have constructed U-boats possessing many features displaying originality and have continued to improve on their first designs. Unfortunately, the Italian Admiralty have been hampered by the lack of funds in obtaining a submarine flotilla of the dimensions desirable to meet all requirements of defence and offence.

In her programme of naval development Russia has afforded the most perfect example of eclecticism; her U-boats have been purchased from the shipyards of many countries and represent many types. Her naval constructors have also provided her with several types of submarines of home design.

Germany also lost time before taking up the question of building of submarines. The first German U-boat was built in accordance with

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the designs of a young engineer who received his training in the French School of Marine Engineering at a time when the designs of the *Narval* type of submarine were being elaborated there. The first German U-boat was an almost exact copy of an improved French submersible named the *Aigrette*; the discovery of this fact caused no little consternation in France. Perhaps, in future, greater precautions will be taken in France, as well as in other countries, to prevent secrets of national importance becoming so easily known to students of foreign nationality. Having a relatively short coast line to protect and with her harbours and dockyards situated mostly in the estuaries of big rivers, Germany has not had to preoccupy herself to any extent in considering the problem of the design of submarines for defensive action; on the contrary, she has from the earliest days concentrated attention on the production of a type of U-boat having a wide radius of action. Her ambition has been to possess a type of submarine which, being based on Wilhelmshaven, could operate off Constantinople or even the coasts of America. Germany was the first nation to provide her submarines with guns; there is little doubt that this step was taken with the deliberate intention of some day carrying on the very war of frightfulness against merchant shipping which we see in progress to-day.

Monsieur Hutter warns us that the information as to the number, etc., of German submarines given by him is not very exact; the *Marine Amt* has at all times taken care not to publish much information concerning the German U-boats.

Chapter III. deals with the subject of the "Utilization of Submarines," and is subdivided into sections dealing with the several aspects of the question.

The following notes present a brief summary of the contents of this chapter.

*The Submarine in Defence.*—From the earliest days of the existence of submarines, naval experts realized that they constituted a powerful weapon of naval defence; for the *rôle* of harbour and dockyard guards there is nothing to equal them. By the use of submarines, the bombardment, by a naval squadron, of important harbours and dockyards can be rendered practically impossible; such is the experience of the present War. Special types of submarines are not a necessity for defensive action; those of the oldest as well as those of the newest design serve the purpose equally well.

*The Submarine in Offence.*—As soon as a high-powered oil engine, suitable for use in submarines, was invented, naval architects concentrated their attention on the design of U-boats endowed with a wide radius of activity and with a speed which would enable them to accompany squadrons of battleships. Much progress has been made in this direction, but the ideal submarine for offence has not yet been constructed. However, submarines have, in the present War, proved their value in the offence with fleets operating not far from their bases, notably was this the case in the Battle of Jutland. The lessons accumulated so far teach that there is a great field for submarines in offence acting as independent squadrons at considerable distances from their bases. It appears probable that in the future small submarines will be built for

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defensive purposes whilst very large ones, capable of cutting their way through the water at very high speeds, will come into existence for the purpose of waging an offensive naval warfare.

*Submarine Minelayers.*—The idea of constructing submarine minelayers was born some years before the outbreak of the present War; but the invention and rapid improvement of the Whitehead torpedo caused the further consideration of this type of U-boat to be abandoned for the time being. The great use which has been made of floating mines in the present Great Conflict and the dangers run by the ordinary types of minelaying vessels caused the question of providing submarine minelayers to be reviewed. In consequence, a certain number of U-boats, designed for the specific purpose of laying floating mines, have been constructed since August, 1914, and have now been in use for some months.

*Submarine War on Merchant Shipping and the Commercial Submarine.*—In addition to the foregoing legitimate methods of utilizing submarines in war Germany has added a fourth.

The nature of the fourth method of warfare, for which piracy is a mild term, was certainly not entirely unknown, but Germany has developed this method of warfare with her customary thoroughness and in defiance of all the rights of nations and dictates of humanity. The acts of her U-boats, in carrying on this fourth mode of warfare, indicate the latest phase of the impotent rage of her rulers and the degree of the loss of mental balance from which the German people are suffering. It is indeed a case of *quos vult perdere Jupiter dementat.* From the point of view of naval warfare the resort to submarine piracy by the German Admiralty exposes its poverty of imagination, whilst from the political view the German people perhaps now realize that this use of U-boats has been the most serious blunder of all the big mistakes which can be laid to the charge of their rulers.

The now famous commercial U-boat, the *Deutschland*, and the problematic *Bremen*, were but efforts of the German authorities to excite the imagination of their own people and, perhaps, the whole world besides, that is to say, the creation of the Commercial Submarine was a part of the great game of bluff Germany has been playing since she let loose the dogs of War. No very difficult arithmetical calculations are necessary to prove that even a very large fleet of commercial submarines of the *Deutschland* type would not enable Germany to reduce the inconveniences of the present blockade, quite apart from the question of the immense capital expenditure and huge running costs that would have to be met for providing and maintaining such a fleet.

*Some Unforeseen Uses to which Submarines have been put.*—In view of the fact that, by submerging with rapidity, the submarine is able to acquire almost complete invulnerability from the effects of gunfire, U-boats have often been used in the present War as scouts, in cases where the ordinary vessels used for this purpose in former times would have run very considerable risks or could not have carried out the mission allotted to them.

Chapter IV. deals with the question of the design of "Engines for Submarines." It is this part of the equipment of a submarine which

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is of prime importance. A great deal of technical information on the subject is contained in this chapter of the volume. It is pointed out that there is a limit to the size of the Diesel oil engines which can be built for use in submarines. As U-boats increase in size more and more powerful engines will be required; it is suggested that in those cases in which Diesel oil engines of 1,000 h.p. will not provide the requirements for the giant types of submarines now contemplated some type of steam propulsion may have to be resorted to.

Chapter V. is devoted to the "Explosives and Armaments used by Submarines"; the subject is dealt with under several heads. It was the invention of the automobile torpedo that made the U-boat a really formidable weapon of naval warfare; and it is with torpedoes of this type that U-boats are largely provided. Some of these torpedoes travel at a speed of 50 knots for the first 1,000 yards after discharge and have an extreme range of 6,500 yards; it is expected that automobile torpedoes will shortly be introduced having an extreme range of 11,000 yards.

The average cost of such a torpedo is about £600, but as a hit from one of them can destroy a battleship worth 3 millions sterling (*i.e.*, 5,000 times its own cost) in a few minutes, such torpedoes must not be considered a luxury.

Guncotton is the explosive which is most commonly used in automobile torpedoes; the charge as a rule weighs 2 cwt.

Many details are given concerning automobile torpedoes and the tubes from which they are fired. A little space is also devoted to a description of the mines and the guns provided for use with U-boats.

Chapter VI. gives a brief description of "The Measures of Defence against Submarines." At first purely defensive action was alone taken; squadrons of light boats were used as patrols at the entrances to harbours, etc., to hunt down submarines; next the use of specially designed nets was brought into use, but now, in addition to the foregoing measure, steps have been taken to arm merchant ships to beat off and attack U-boats, and a considerable use is also being made of hydroplanes and seaplanes in carrying on a vigorous offensive war against the modern pirates.

Chapter VII. deals with "The Exploits of the Entente Submarines." Brief descriptions are given of the deeds of daring carried out by the U-boats of the Entente Powers in (*a*) the Sea of Marmora; (*b*) in the Baltic; and (*c*) in the Adriatic. The officers and crews of these U-boats have afforded great examples of courage, resourcefulness and skill; the names of many of them will be handed down from generation to generation as a tradition of how to do and how to die.

The 131st number contains the official communiqués issued by the Central French Government to the Provincial Authorities during the months of February and March, 1917; it is Volume XXVIII. dealing with this particular subject.

In an Appendix are given the text of the message of congratulation sent by President Poincaré to King George V. in February, 1917, after the capture of Kut-el-Amara, and the latter's reply thereto.

W. A. J. O'MEARA.

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# *NOTICE OF MAGAZINE.*

*REVUE MILITAIRE SUISSE.*

*No. 5.—May, 1917.*

THE GERMAN OPERATIONS IN THE WESTERN THEATRE OF WAR, 1914 TO 1917.

Colonel Feyler has been peculiarly advantageously placed for studying the momentous events which have been shaking Europe to its foundations since August, 1914; he gives us the benefit of his views in an article, the first part of which appears in the number of the *Revue* now under notice. The article appears at a very opportune moment, *i.e.*, at a time when after campaigns representing the three phases of war, the offensive, the counter-offensive and the defensive, the German Army in the Western Theatre has had to withdraw to the "Hindenburg Line." Colonel Feyler seeks, in his article, to explain the causes which have led to this retrograde movement of the Kaiser's hosts.

The operations carried out since the beginning of the War to the end of 1916 can be considered to possess six principal phases, as follows:—

1. The invasion of Belgium, including the battles on the French frontier.
2. The Battle of the Marne.
3. The Race for the Sea.
4. The Battle of Flanders.
5. The Battle of Verdun.
6. The Battle of the Somme.

*1.—The Invasion of Belgium, including the Battles on the French Frontier.*

The events connected with the early days of the Great War are still fresh in men's minds. Seven German Armies having concentrated on a front lying between the N.W. Swiss frontier and S.E. Dutch frontier, operations were begun by these Armies making a great wheel to the left, with Basle as a pivot of manœuvre. The German right wing marched rapidly across Belgium, between the Meuse and the sea, with the object of enveloping the left, and may be both flanks, of the Entente Armies concentrated in the N. of France and supposed at the time to be ranged up along the Lorraine front and in the Belgian Ardennes.

Colonel Feyler points out that so long as precise documentary evidence is not available, it behoves a critic to exercise extreme circumspection in forming a judgment on the acts of an Army Chief. The great public, however, do not appreciate the importance of maintaining reticence under such circumstances. Should a General meet with reverses the bitterness of their reproaches are as extreme as the loudness of their praise when he

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meets with successes. The qualities of a General, as indeed of a man in any calling, cannot be estimated alone by the success or failure of his plans, but account must also be had of the intelligence that has been brought to bear in framing them, of the nature of these plans and of the method adopted for executing the same. History teaches that in the same way that the best of schemes are, at times, liable to miscarry by reason of some mischance which cannot be allowed for, likewise schemes which are most unpromising are, at times, crowned with the most brilliant success by reason of some unforeseen accident. In the first case the superior skill of a General is not transformed into incapacity merely because of the jeers of the public; in the second case the mediocre qualities of a General undergo no conversion into brilliant leadership by reason of the acclamations of the public.

Colonel Feyler is content for the present to state that so far as the main framework of the German plans is concerned it creates an impression on the mind of a manœuvre which was worked out with great minuteness, launched with great skill and supervised with great care. Whether his remarks are to be taken as praise or condemnation depends, he says, on the point of view from which the subject is examined. Praise must be implied in his words if the view is taken that it is right to employ troops in accordance with a reasonable plan, although without providing fully for the counter-measures likely to be adopted by an opponent to meet it. On the other hand condemnation must be read into the Colonel's words if the plan spoken of as reasonable is merely the simple manifestation of a preconceived idea. It may well be that in 1914 the German Higher Command expected their faith in an idea to work miracles for them. A nation endowed with the genius for organization organizes victory as it organizes success in other realms of life. To do so it is but necessary to ascertain with some measure of exactness the factors in the equation the answer to which spells *victory*.

It is most desirable that the German official account of the Franco-German War of 1870—1871 should be studied by those who desire to understand the nature of the preparations made in Berlin for the campaign of 1914; this work pretends at being something more than the story of the events of a successful campaign, it claims to be a treatise on the best method of conducting a modern war.

Moltke, the victor of 1870, became, in the imagination of the swollen-headed Teuton, the prototype of the General who organizes war on scientific and perfect lines, a war in which what is left to chance is reduced to microscopical proportions; Moltke was proclaimed by the sons of the Fatherland as a military genius superior to Napoleon, and many other great captains. This belief arose not solely by reason of the military successes achieved by him but was as much due to the very extraordinary assumption that the Germanic race excels all others and is superior to them in every field of adventure. And yet Moltke only conducted two great campaigns to the great Corsican's fourteen, and on each of these occasions repeated the same manœuvre. Sadowa, the attempts to envelope the French flanks on the Sarre, at St. Privat and at Sedan are all operations of the same type.

On comparing the German deployment of 1914 with the operations just

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referred to an impression is created on the mind that the Great General Staff, or at least the General who inspired it, have adopted this as their *standard manœuvre*, the sure road to organized victory. The military literature published in Germany during the past forty years has drummed the same idea into the heads of generations of Teuton officers. The lessons to be derived from ancient and modern wars have only been considered useful so far as they bear on the German *standard manœuvre.* Attention is called to an article entitled " Cannae " by Field Marshal Schlieffen, which appeared in the *Viertel Jahrshefte für Truppenführung* just before the outbreak of the present War. In the article in question Moltke's strategy at Sadowa and at Sedan is likened to that of Hannibal's at Cannae, and the opinion is expressed that victory is the heritage of the General whose plans are most nearly modelled on the manœuvres which won Cannae, Sadowa and Sedan. It was on these lines that the Great General Staff arranged for the imposing wheel to the left of the Teuton hosts in their march across Belgium in 1914.

What actually was witnessed on the French frontier were German attacks against both the Allied wings and against their centre.

The French General Staff, having decided to violate neither the neutrality of Belgium nor that of Luxemburg, had concentrated five Armies along the Vosges and had held them ready to advance into Alsace and into Lorraine. As soon as the German invasion of Luxemburg and of Belgium became an established fact, the French left flank was extended westward, in the Ardennes, and preparations were made for an offensive stroke towards the north. During August, 1914, the British Army prolonged the French left further westward as far as Mons.

On the immediate right of the British troops stood the French 5th Army, between Mons and Charleroi. It was against this left wing of the Entente Army that the German I. and II. Armies, comprising some half million men, was directed. In spite of their numerical superiority, the *élan* of the Teuton soldiers and the *communiqués* of the Imperial Great General Staff reporting that the British Army was dispersed and flying to its ships, the German right wing failed to envelope the left flank of the Allies. The latter escaping from the grip of the invaders retreated up the valley of the Sambre and then descended towards Paris down that of the Oise.

The central attack took place in the Ardennes, where a number of collisions took place between the opposing armies, viz. :—between the German III., IV. and V. Armies, comprising some 550,000 to 600,000 men, and the French 4th, 3rd and Lorraine Armies, comprising about 450,000 men. Some very hard fighting took place, but here also the vanquished troops were able to free themselves from the invader and retired southward, crossing the Meuse, the Aisne and the Marne in doing so.

The German VI. and VIII. Armies directed against the French right wing were soon held up by the fortified barrier held by the French 2nd and 1st Armies (Castlenau and Du Bail).

### 2. *The Battle of the Marne.*

As was the case in 1870, when the first attempt of the Germans to overwhelm the French troops (on the Sarre) failed, so was it in 1914. The

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right wing of the Allies maintained their hold on the French eastern military frontier. The centre and left of the Allies were able to break off their engagements with the invaders before they had become too seriously entangled; they were thus able later to make a stand on a united front further south on the Marne, with its left resting on the fortress of Paris and its right on the fortress of Verdun. In prolongation of the Marne front Du Bail's and Castlenau's Armies continued to hold on to the line Verdun-Nancy-Belfort and thus safeguarded an inroad into the area in rear of the river front in question.

The Allied Armies on the Marne were drawn up in the following order :—

French 3rd Army S. of Argonne heights, facing N.W., with its right resting on Verdun.

French 4th Army astride the Marne at Vitry-le-François, to the S. of Chalons. French 9th Army (a new formation placed under Foch) Mailly to Sezanne.

French 5th Army in the region N. of Provins. The British Army was in the gap between the French 5th Army and Paris.

The French 6th Army was, at this time, in process of being formed in Paris under Manoury. Gallieni was in command of the Paris garrison.

The above positions were occupied by the 5th September. The German troops in pursuit of the Allied forces had made a great wheel to the left and on arriving at the northern frontier of France faced S.W. They continued their southward movements in the following order :—

German V. Army, the pivot for the great wheel, stretched along the borders of Argonne in the direction of the French 3rd Army, to which its left was slightly exposed.

German IV. Army had come through Belgian Luxemburg; crossing the Meuse at Mezieres, it deployed S. of Chalons opposite the French 4th Army.

German III. Army crossed the Marne at Epernay and struck the right of the French 9th Army, whilst the German II. Army, which had crossed the river at Château-Thierry, aimed at the left of this French Army.

To the German I. Army under Von Kluck was assigned the task of enveloping the Allied left. It formed the German right and consisted of five Army Corps and one Cavalry Corps. This was the Army which had driven the British Army from Mons on Paris. On reaching the neighbourhood of the French capital, it wheeled to the S.E. leaving this fortified centre on one side. This German Army, having crossed the Marne at Meaux, found itself faced by the French 5th Army and the British Army, whilst Manoury threatened it on its exposed flank.

The movements of Von Kluck's Army provided the determining factor in the issue of the battle. Whilst, at the time that the invaders reached the French frontier, their Armies were converging on the front occupied by their opponents as if to nip them between the jaws of a pair of pincers, on the other hand, in the further advance southwards the German columns closed on one another and ended by narrowing their front to such an extent as to march into the jaws of the Allies' nutcracker.

Von Kluck only left one of his Army Corps on the north bank of the Marne to watch Paris. Consequently, when Manoury issued against

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the German right and it became necessary for Von Kluck to reinforce the single Army Corps originally left on the N. bank of the Marne successively by the other four corps of his Army, a gap was created between the German I. and II. Armies. This gap was for a time filled by Von der Marwitz's Cavalry Corps, but under the circumstances this Corps could alone form a screen. When the German II. Army had to conform to the retrograde movement of the I. Army another gap was created between the German II. and III. Armies, and into it Foch's Army, supported by other French troops, penetrated. This settled the matter; the five German Armies thereupon took refuge behind the line of the Aisne.

*Comments on the Strategy.*

The question of whether Von Kluck did right or did wrong to advance to the Marne as he did has been much discussed in the past, and is likely to be much discussed in the future.

Colonel Feyler expresses the opinion that Von Kluck acted strictly in accordance with the dictates of correct strategy; he aimed at the destruction of the enemy's main army before all things else. Had the Allies been defeated on the Marne, it is hardly likely that Paris could have been saved.

The defeat of the French Armies in the autumn of 1870 eventually led to the capitulation of Paris in January, 1871; by like relations of cause and effect, the success of the Allies in the autumn of 1914 saved Paris in the present War. It must not, however, be assumed that had the Germans won on the Marne Paris would for a certainty have fallen to Von Kluck's Army.

One great fault must nevertheless be imputed to Von Kluck, one of which other German leaders, aye, the whole of the German Army and the nation itself have also been guilty; he and they have altogether underestimated the power of resistance of their adversaries and have failed to put a proper value on the early German victories won in Belgium and on the Meuse.

The Great General Staff made their first mistake in strategy at this stage. Their intention being in the first place to effect the concentration of the largest possible German force in the Western Theatre for the purpose of crushing France completely before dealing with the Russians, nothing should have been allowed to disturb this plan of campaign. The retreat of the Belgians into Antwerp led to a part of the German Army, originally intended for the offensive stroke against the French Army, being detached for the capture of the Belgian fortress; this could not be avoided. But the Russians, having mobilized earlier than was expected and having invaded East Prussia, the army originally told off for the operations against the French Army was further weakened by the transfer of one, or may be of two, Army Corps to the Eastern Theatre; this was wrong. Had the Great General Staff entertained the smallest doubt as to the issue of the struggle in the Western Theatre they should most certainly have refrained from withdrawing any troops whatever from Belgium or France. The presence on the Ourcq of the one, or the two, Army Corps transferred to East Prussia might have produced a totally different situation in the region immediately east of Paris than the one now recorded in history.

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The *communiqués* of the Great General Staff issued between the 21st August, the date of the first German success, to the 3rd September clearly indicate the views held by the German leaders. The perusal of these *communiqués* creates the impression that the complete annihilation of the enemy by the Teuton hosts was believed to have been accomplished. The German thrust against the Allied front on the Marne was not an isolated move. The Great General Staff had not at that time abandoned the hope of enveloping the right as well as the left wing of the Franco-British Armies. Evidence of this exists in the attack made on the Grand Couronné of Nancy, the capture of which would have opened a line of advance for the German Armies by the Charmes gap, between the fortresses of Toul and Epinal. A German victory in this region would have been decisive, as it would have made it impossible for the Allies to hold the Marne position.

### 3. *The Race for the Sea.*

When the Allies found it impossible to pierce the fortified front taken up by the Germans on the Aisne, they endeavoured to envelope the German right and to turn it. To meet this danger the Germans in their turn attempted to carry out a similar operation against the Allied Armies. Thus it was that by successive steps both the opposing armies extended their westernmost fronts in a northerly direction until the flanks of these armies eventually reached the sea on the Belgian littoral. But before this movement could be completed, a new and imposing German Army made its appearance in Western Belgium. It was announced that the objective of this new Army was Calais.

These new German formations first came into collision with the Belgian Army, which, having escaped from Antwerp, had marched along the sea coast and on reaching the Yser faced about to make a stand against their pursuers.

A French Army having been sent to the assistance of the Belgians, the new German formations in question next came into collision with these reinforcements at Dixmude and Ypres and finally met the British troops about Ypres. The two great struggles on the Yser and Ypres which lasted from the middle of October to the middle of November are now spoken of as the Battle of Flanders.

### *Comments on the Strategy.*

Having met with a reverse on the Marne, the Germans withdrew to a fortified position on the Aisne; they had now decided to act on the defensive for a time. Colonel Feyler points out that no army acts on the defensive when any other course is open to it; and even then it only does so in the hope of being able to obtain the initiative again, in order to resume the offensive as early as possible. Under cover of fortified positions defenders are often able to collect large masses of reserves. Such reserves are then available, on the one hand, for repelling the attacks of troops that may succeed in piercing a defensive position, and, on the other hand, these reserves can be used for a counter-offensive, which, if successfully carried through, may enable the defenders to dominate the movements of their assailants.

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A modern battle consists of a prolonged struggle in which fresh troops are successively and constantly being brought up, from the beginning of the fight or as they become available, to those parts of a front where they can be utilized with the most telling effect. Defeat is suffered by that side whose freshest reinforcements, worn out by a succession of violent onslaughts, persuade themselves that further efforts on their part for the purpose of altering the course of the battle are useless.

The above statement describes the general character of the fighting which ended when the Race for the Sea proved a dead-heat. The Allies tried to find out the weak portion of the German front on the Aisne in order to pierce it ; the Germans, however, not only effectually covered the portions of their front which were assailed, but in their turn counter-attacked against the portions of their adversary's front which they thought to be most vulnerable or which were most suitably situated as starting places for the resumption of the offensive by them.

The Germans first of all strengthened their right wing ; it was here that the danger to them was most threatening. They were compelled to swing back this wing, on the right bank of the Oise, so as to face westward.

At the same time, they made a counter-thrust in a way that seems to prove that they had not lost all hope of continuing and renewing *offensive operations with both their wings*. Until about the 20th September, 1914, they were active around Verdun and in the angle in the part of the front W. of Noyon. Simultaneously a violent blow was struck by them against the Allied centre about Rheims. Shortly, it may be said that the Germans delivered a *general counter-attack*.

Subsequently the German counter-attacks became local. The thrust against Verdun and the Allied centre were abandoned, troops being withdrawn from these sectors in order to be used as reinforcements to the German right wing. Frequent counter-attacks, designed in great depth, were launched in the directions of Noyon and of Roye, where the French were obliged in consequence to give ground. As new French formations were brought to the front to prolong the Allied left flank, the German counter-attacks were delivered further and further northwards. The Germans thus successively reached the Ancre, the Somme and Arras, but they persisted in the efforts further south, at Roye, at Noyon, at Lassigny.

In Belgium, an attack was undertaken against Antwerp. It was urgently necessary to release the German troops in this neighbourhood for other purposes, but this could not be safely done until the last of the Belgian strongholds was in German hands. The fortress fell, but the Belgian field army within it was able to make its way out. A part of the Belgian Army made good its escape and reinforced the Allied left wing. At the time it was approaching the Yser, the German counter-attacks had enabled the Kaiser's troops to reach Lille and the valley of the Lys.—(*To be continued*).

## The Italo-Austrian Theatre of Operations.

The article on the above subject begun in the *Revue* for April, 1917 (*vide R.E. Journal*, August), is continued in the number under notice.

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A number of photographs showing Italian defence arrangements in the snow-clad mountains are reproduced in the text and a sketch-map is also provided showing the Italian front from the Adriatic, near Monfalcone, to M. Santo.

An extract is given from Capt. Paul Simon's *Les Principes de la Guerre Alpine* in which he says with reference to the Alps: "Not only are they the strongest and most magnificent rampart to France, but they comprise the only field where ideal warfare can be conducted in these days, warfare in which numbers count for little, in which valour is the paramount consideration!"

Events of the past few months have confirmed the accuracy of the above statement. Those who have been living in the mountains along the Italian frontier and have expended their energy in the national cause will some day be able to tell of the extraordinary things that have been accomplished.

The object of all military operations is to-day, as of yore, the destruction of the enemy forces; but in order to accomplish this it is, perhaps, more necessary to-day than was formerly the case for a commander in the field to reach the decisive zone not only with his full strength and with the various parts of his command united, but it is also essential that he shall have under him troops sufficiently large in numbers to enable him to deal effectively with the forces his adversary may bring against him. On the Italian northern front, Austrians not only desired to draw as large a part of the Italian Army as possible into the Trentino, but also to cut it off completely from the Venetian plains in such a way as to bring about the capitulation of the Italians operating on the Isonzo.

It is pointed out that in order to succeed in a venture such as that upon which the Austrians entered in 1915 it is essential to utilize every means of communication and to attack along the whole front simultaneously and with equal energy. The Trentino is ill-provided with roads and it is, in consequence, difficult to establish lateral communication between columns moving on more or less parallel roads. This accounts for the fact that the important fighting on the Italian northern front took place in the near neighbourhood of the great routes that traverse this mountain barrier. In retiring from successive positions, the Italians continually made offensive thrusts whenever an occasion offered; the Austrians had, in consequence, to make superhuman efforts to enable them to effect any progress. The Italians knew the ground on which they were fighting intimately and took advantage of all its features which could be turned to profit by them. It is suggested that those who read the accounts of the fighting in which the Italians have been engaged are apt to lose sight of the great difficulties they have had to contend with in the upper mountain regions (above 6,000 ft.). It is for the special benefit of such persons that the photographic views which appear in the *Revue* are published; these views have certainly a high educative value.

The Austrian offensive in the Trentino might have had important consequences in spite of the fact that Austrian forces were unable to penetrate as far as the Venetian plain, if thereby the Italian operations had been paralyzed along the whole front on which the Austrian and

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Italian Armies were in contact. However, as it is well known, the Italian Higher Command, towards the end of June, 1916, was able to conduct an offensive on the Isonzo; by the first week in August the Italian artillery and other attacking troops had moved into position. Active operations actually began on the 4th August.

The Italian Eastern Front, of which Gorizia is the principal objective from a military as well as political point of view, consists of four distinct sections :—

1. The section Sabotino-Oslavia-Podgora to the N.W. of Gorizia.
2. The section M. Santo-M. San Gabriele-Zoerenz to the N. and N.E. of Gorizia.
3. The Carso section, with Doberdo as its centre and bordered on the east by the Vallone.
4. The Vertojbizza section with its culminating point of San Marco.

The above four sections of this front constitute a quadrilateral and form a strong retrenched camp. Further south lies the section of front to the E. of Monfalcone and comprises the important Vallone-Duino road.

The Carso plateau is perhaps the most formidable part of the front on which an attack can be delivered. The Vipacco and the Isonzo form natural ditches along this bastioned-like front, whilst San Michele and the Cosich constitute extremely strong keeps on the N. and on the S. of this front respectively. From these keeps the whole plain and the passages of the Isonzo can be brought under fire.

It is owing to the very difficult nature of the *terrain* that it has taken the Italian Army so long a time to become master of the Carso.

The attack on the Gorizia-Carso section was preceded by an action S. of Monfalcone, launched on the 4th August, 1916, with the object of drawing the enemy's forces to this region. The Italians at first succeeded in gaining the heights immediately to E. of Monfalcone, but were driven back later by a violent counter-attack. However, two days later the Italians again moved forward early in the morning; M. Sabotino, the heights of N.E. of Oslavia and M. San Michele were captured by the attacking troops, who succeeded at nightfall in reaching the lower slopes bordering the Isonzo.

Fighting continued and, on the 8th August, the Italians succeeded in crossing the Isonzo and in establishing themselves on the eastern bank of the river. On the day following, the Italians entered Gorizia and established themselves on the heights E. of Gorizia and San Andrea.

The operations on the Carso and at Monfalcone continued for some days, powerful attacks being delivered against the Austrians who fought with desperation. The Italians eventually captured the Doberdo plateau, and this caused the fall of Debeli. On the 15th August, the western slopes of the Pelinka passed into Italian hands. The character of the fighting now changed. It became necessary to devote a little time to the replenishing of gaps in men and materials caused by the heavy fighting. Time was now devoted by the Italians to the work of consolidating themselves in their newly gained positions. During these operations the Italians took 18,758 Austrian prisoners, including 393 officers, and captured 30 guns, 63 trench mortars, 92 machine guns, 12,226 rifles, 5 million rounds of S.A.A., 3,000 rounds of artillery ammunition, 60,000 grenades, etc., etc.

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Whilst fighting was in progress on the Isonzo, minor operations were also engaged in by the Austrian and Italian Armies in the upper valleys of the Avisio, of the Brenta, of the Tofane, on the heights of the Cristallo, and of the Tonale, in the valleys of the Ledro and of the Astico, on the heights of Asiago, in the Val Sugana and along the mountain tops further east. From September to the end of 1916, fighting continued along the whole of the Italo-Austrian front.—(*To be continued*).

## IMPRESSIONS FROM THE AUSTRO-HUNGARIAN FRONT.

The article on the above subject begun in the number of the *Revue* for August, 1916 (*vide R.E. Journal* for November, 1916, *et seq.*), is continued in the number under notice. A sketch-map on a scale of $\frac{1}{200000}$ is included in the text of the *Revue* article.

### VI. *The Upper Isonzo.*

The more important points along the Isonzo front from Flitsch to M. Sabotino near Gorizia are the Rombon (7,242 ft.), Flitsch, M. Nero (7,364 ft.) and the bridgehead of Tolmino. The Italian frontier on this part of the front follows the crest of the mountains on the western bank of the Isonzo. At the time that the *Revue* article was written the Austro-Hungarian troops were holding the left bank of the river, except at Flitsch and at Tolmino.

The bridgehead, at the last-mentioned place, is not of any considerable military value; but the Austrian infantry have made frequent attempts to seize this river crossing. The bridge at Santa Luzia, $2\frac{1}{2}$ miles below the Tolmino Bridge, just north of the confluence of the Isonzo and the Idria Rivers, is really the most important point on this part of the front. Although it is dominated by M. Kolovrat yet it is covered to a great extent by the wooded heights S. of Santa Maria and by the Santa Luzia Ridge, both situated on the right bank of the river.

The Upper Isonzo front (31 miles in extent) was, in December, 1915, defended by a single Austrian Army Corps, reinforced by a few Landsturm battalions belonging to this region and by troops of the Customs service. When the Italians arrived on the scene, the Austrian *troupes de couverture* were withdrawn to the left bank of the river. The personal observations of the author of the *Revue* article during a visit to the Tolmino Sector are recorded in this part of the article. He tells us that, as is the case in other theatres of operations in Europe, so also on the Isonzo, the artillery has been continuously increased; consequently the proportion of guns to rifles is much higher now than at the date on which shots were first fired on this front. The losses of the Austrian artillery have been slight, since artillery duels have been the exception on this front.

The Austrian troops occupying a part of this front are Italian-speaking soldiers drawn from Istria. It is stated that they bear no friendly or fraternal feelings for the Italian troops opposed to them. The national sentiment is stronger in them, it is said, than the tie binding them to their parent stock, now that the defence of the soil of their natal land is the problem which faces them.

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## Notes and News.

*Switzerland.*—A special correspondent contributes a few notes concerning affairs in Switzerland. He opens with a few sarcastic remarks regarding the censorship and refers to a few of the " secrets " which are public property and are being openly discussed.

Complaint is made that belligerent aviators, both German and French, have frequently flown over Swiss territory since the spring campaigns started. They have been even fighting one another over neutral territory. These aviators as a rule fly, it is said, at too great an altitude to offer a good target to the Swiss anti-aircraft guns.

The violations of aerial neutrality, it is pointed out, lead to the expenditure of a large quantity of ammunition, neutral as well as enemy, and this has the serious disadvantage that Swiss subjects are put in jeopardy by the rain of projectiles fired on these occasions. The experience of the past year points to the fact, in the opinion of the writer of the original *Revue* notes, that the Swiss anti-aircraft defences are insufficient. He urges that the time has arrived for the authorities to take energetic steps for the purpose of installing a large number of long-range anti-aircraft batteries along the Swiss frontier.

It is further pointed out that the civil and military authorities are out of touch with one another; the friction between them is causing the Swiss citizens inconveniences in many directions. It is emphasized that the Swiss national motto is not: *Every one for himself*, but *One for all, and all for one.*

*Portugal.*—A special correspondent contributes an article dealing with the Portuguese Expeditionary Force which had just arrived in France at the time the *Revue* notes were written. He recalls the attitude of the reactionaries, who, in the early days of the War, did their best to prevent any military co-operation with the Entente Powers on the part of Portugal. Strange doctrines relating to neutrality were preached at that time. However, the sympathies of the Portuguese masses for Belgium and for France were too genuine to allow the Portuguese Government to stand aside; the masses well understand that had not Portugal's geographical position protected them their fate would have been similar to that of the Belgians, the Serbs and the Roumanians. It is pointed out that by the terms of the recent Anglo-Portuguese Treaty Portugal was practically bound to come into the War. However, Germany forced the pace by her treatment of the Portuguese Colonies and merchant marine.

Two Portuguese divisions have been mobilized and have linked up with the Entente forces on the Western Front. Portuguese soldiers are proud of the privilege that has been accorded them of playing a part, small though it must necessarily be, in building a new Europe on a foundation the basis of which is the Right and Justice of Nations.

*International News.*—Attention is called to an interesting work entitled *Le Mensonge du 3 Août*, 1914, recently published by Payot et Cie, of Lausanne and Paris. It not only deals with the diplomatic situation preceding the Great War but also with the early operations on the Western Front. The author of the work remains anonymous; whoever

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he may be the work in question indicates that its author is exceptionally well informed concerning the events on which he writes.

This number of the *Revue* contains a bibliography relating to works of military interest.

SUPPLEMENT.

A further instalment of the Colonel Galiffe's *L'Occupation des Frontières par les Troupes Suisses en* 1870—1871 is issued with the number of the *Revue Militaire Suisse* for May, 1917. This instalment completes the story of the events dealing with the Defensive Period (January and February, 1871).

Chapter IV. of this section of the work is entitled "Entry of the Army of the East into Switzerland."

The Swiss Military Authorities continued during January, 1871, to move Federal troops from Porrentruy on Neuchatel in order to meet eventualities in the neighbourhood of the latter place.

During the night of 31st January—1st February, 1871, columns of French artillery and supply trains, accompanied by a large disorganized band of French soldiers, were moving by road from Pontarlier on Verrières. The Chief Paymaster of the French Army of the East, who had arrived at Verrières, was most anxious to save the specie in his charge and made an urgent request to the Swiss Military Authorities for permission to be allowed to enter Switzerland with the vehicles carrying the treasure chests. In the meantime, the French Consul at Neuchatel called on General Herzog on his arrival there and requested him to allow Clinchant's Army to retire into Switzerland and to receive a *parlementaire* from the French Commander; this *parlementaire*, Colonel Chevals, presented himself at the Customs post of Meudon at 3.30 a.m. on the 1st February. General Clinchant was at this time at Verrières, impatiently awaiting the decision of the Swiss authorities in relation to his request. General Herzog at once met Colonel Chevals who had been delegated by General Clinchant to enter into a Convention detailing the conditions under which the French Army would be permitted to cross the Franco-Swiss frontier. General Herzog's proposals, except one relating to the sale by auction of horses which was postponed for future consideration by the French and Swiss Governments, were at once accepted by General Clinchant's representative.

Under the terms of this Convention, the arms, equipment, vehicles, horses, munitions, etc., of Clinchant's Army were to be delivered into the custody of the Federal Government, in order to be restored to the French Government on the conclusion of the War; private wagons carrying supplies, etc., for the troops were to be permitted, after depositing their contents on Swiss soil, to return to France with their drivers and teams; officers and other ranks were to be interned at places to be selected by the Federal Government. General Herzog spontaneously offered to allow the French officers to retain their swords, horses and effects; he was warmly thanked for his generous act by Colonel Chevals.

Three copies of the Convention were sent off post haste to General Clinchant, who was waiting for the same on the frontier; having read the terms of the document in question he signed the same without comment. At 5 a.m. the Swiss officer in command at Verrières

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received instructions to allow the French troops to enter Switzerland.

General Clinchant, who exhibited much impatience, was one of the first to enter Switzerland. The French column was headed by the vehicles carrying the treasure chests and by the postal vans; these were followed by the artillery. This part of Clinchant's Army occupied eight hours in passing from French into Swiss territory. Next followed a disorganized mob of soldiers of all arms who had completely lost all cohesion, all trace of a military organization having disappeared.

The disarming of the French soldiers was effected at Meudon, no difficulty being experienced in carrying this out. Owing to the narrowness of the valley by which the French entered Switzerland at Verrières, it was necessary for the French soldiers continually to march forward. In consequence even those who had entered first were kept on the move till late in the evening. During the night the French column was brought to a halt owing to a block which took place in Fleurier. It had been decided to suspend the entry of the French into Switzerland during the night, but it was not possible strictly to do so. During the whole of this day (1st February) the guns of Fort de Joux were pouring out shot and shell, and the valley along which the French were retiring was occupied by lines of *franc-tireurs*.

The preparations which the Federal Authorities had made for supplies provided for the feeding of 80,000 men; this provision was based on a report made by General Herzog. However, the French Staff appeared to have come to the conclusion that a part of the Clinchant's Army would be able to make good its escape from Manteuffel's Army and that only some 42,000 men would be neutralized in Switzerland.

The Swiss troops occupying the various passes of the Juras had been advised on the 31st January that Clinchant's troops were to be allowed to enter Switzerland and to be disarmed on entering Switzerland, but the whole of the terms of the Convention were not communicated to the Cantonal Authorities until the 2nd or 3rd February; this led to some misunderstandings in a few cases. Further, the German Commander was not notified that a Convention had been entered into with General Clinchant permitting him to enter Switzerland with his army; had this been done, it is probable that some useless bloodshed might have been averted.

The French retirement into Switzerland was continued on the 2nd February; during these first two days, at Verrières alone 33,500 men, 400 horses, about 300 guns and 1,000 military vehicles crossed the frontier. On the date last mentioned, 13,000 to 14,000 men with 1,100 horses also entered Switzerland at Sainte-Croix. Bands of soldiers continued to pass over from France into Swiss territory at various points up to the 5th February; on the date last mentioned, after a lively cannonade at the Fort de Joux, about 100 French soldiers crossed the frontier and arrived at Vallorbe. At many other points of the frontier French soldiers were able to escape the vigilance of the Federal troops and enter Switzerland by routes on which no guards had been placed.

The Germans followed closely on the heels of the French and formed a cordon along the Swiss frontier; they occupied les Fours and placed

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a regiment at Jougne. On the 9th February, the bulk of the German Army was withdrawn from Pontarlier, where it had concentrated, in order to regain the Saone Valley.

The French force which took shelter in Switzerland comprised the following :—85,410 men, of whom nearly 5,000 were sick ; 10,778 horses ; 266 field guns and 19 machine guns ; 1,158 military vehicles.

Chapter V. deals with the demobilization of the Swiss troops.

The French Army of the East being safely interned and the Germans having in consequence withdrawn from the Swiss frontier, the probability of a violation of Swiss territory now became remote. The Swiss frontier zone was still infested with *franc-tireurs* who caused more annoyance to their own people than to any one else. General Herzog announced that, after the 3rd February, the *franc-tireurs* who had not taken advantage of the Convention but remained in arms would no longer be considered as regular belligerents and would, in consequence, not be allowed to enter Switzerland after that date. The *franc-tireurs* who were at this time roaming along the Swiss frontier were desperadoes who behaved themselves as veritable brigands ; they took practically no notice of General Herzog's announcement. Here and there the Swiss Military Authorities had to call up additional units or to alter the disposition of troops to meet the situation created by the presence of these *franc-tireurs*. However, on the 6th February, a partial demobilization of the Swiss Army was commenced by dismissing to their homes the greater part of the artillery that had been called out. By the 9th *idem*, the men who had composed Clinchant's Army had been removed sufficiently far inland to justify a further demobilization and orders were issued accordingly and only a very thin cordon of Swiss troops were left on the frontier ; by the 16th *idem*, only 3 brigades, 3 companies of dragoons and 1 battery remained on duty. On the 3rd March one of these brigades was demobilized and on the 25th *idem* the remainder of the Swiss troops were released from duty and the military cordon which had been in existence along the Swiss frontier for seven months was completely withdrawn.

During the third period of vigilance in Switzerland 19,439 men and 54 guns of the Federal Army were employed on observation duties along the frontier.

W. A. J. O'MEARA.

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# REINFORCE
# CONCRETE ROADS
## WITH
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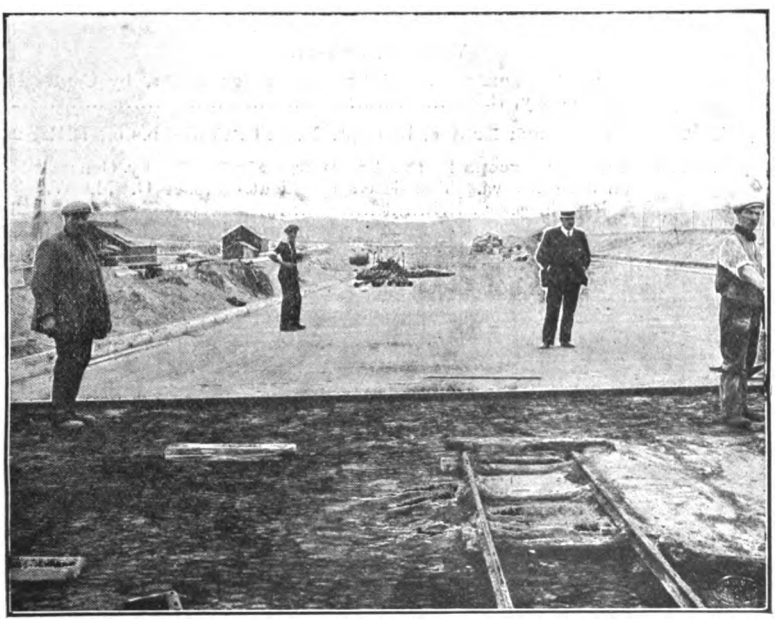

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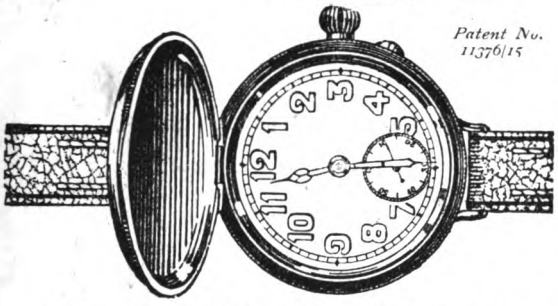

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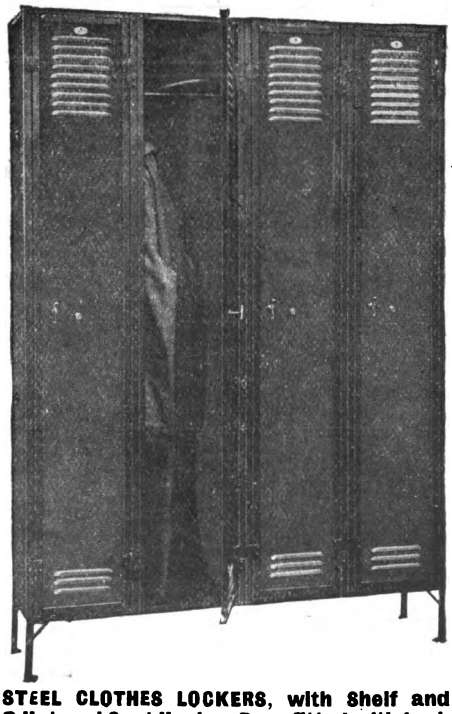

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# *THREE-HINGED TIMBER ARCH, 150-FT. SPAN, CALIFORNIA STATE HIGHWAYS.*

*By* MAJOR V. P. SMITH, R.E.

THIS timber bridge, one of many on the main highway from San Francisco to Eureka in the State of California, has been completed only recently and presents some points of interest. The local conditions somewhat resemble those which R.E. officers often meet with in India and the Colonies, that is to say an out-of-the way site to which transport is difficult, a scarcity of materials for masonry or concrete, and a plentiful supply at hand of standing timber of very moderate quality. This case is one in which though the state concerned is by no means a backward one in its methods nor the engineers prejudiced against steel, wood has been chosen in preference to other materials. Moreover despite a considerable span and quite a heavy assumed loading it has been found possible to make use of a comparatively inferior timber, redwood, which is roughly about 30 per cent. weaker than first-class pine

Redwood when dry is lighter than good pine, shrinks very little in seasoning, and can be used with safety in a comparatively green state. Its life is estimated at 20 to 30 years. It is weak, like most pines, in resisting compressive stresses normal to the grain. This weakness (which does not always receive the attention it deserves in designing) in this case lead to the rejection of a design for a 180-ft. Howe truss as it involved rather heavy iron bearing plates and castings which would have been expensive to transport to the site. The working stresses adopted were:—In flexure 1,100 lbs. sq. inch; compression in columns 1,100 $\left(1 - \frac{l}{60d}\right)$ lbs. sq. inch; compression perpendicular to the grain 200 lbs. sq. inch; shear parallel to the grain 80 lbs. sq. inch.

The site is a deep gorge with precipitous timbered sides so erection over false-work was not considered practicable. The design selected was a three-hinged crescent-shaped arch, to be erected by lifting the trusses bodily into position by overhead cables.

The loads calculated for were 100 lbs. per sq. foot of roadway on the arch and on the floor 10 tons and 5 tons respectively on two axles 10 ft. apart. This it may be noted is quite a modern and heavy loading. In France for instance our heaviest military highway loading (excepting "tanks") is a 6-in. gun, axle loads 14 and 2·7 tons

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respectively on axles 19 ft. 6 in. apart. With some special precautions in the case of the largest loads a bridge of this sort would therefore take the heaviest highway traffic that is known.

" The shape of the trusses," it is stated, " was determined graphically by drawing funicular polygons for the extreme conditions of loading. The chords were then located outside these polygons in order that no condition of loading would put members in tension. It was necessary to design the joints to take tension, however, particularly those of the lower chord, in order to take care of erection stresses. The dead load and full live load stresses and the positions of the live load for the maximum and minimum stresses in the various members were determined graphically, the maximum and minimum stresses being the algebraic sums of the dead and live loads."

The article on which this description is based unfortunately contains no measured drawings. The drawing produced here, which is the work of Sapper W. A. Johnson, is based on a careful study of the four photographs which were given. The chords were made of 12-in. by 12-in. timbers, the upper chord being spliced at every panel and the lower chord in three places only. The panels measured 10 ft. horizontally. The footings were able to be based on the solid rock, levelled up where necessary by a little concrete. The hinge pins rested on castings anchored to the rock by bolts.

For erection two trestle frames, large enough for complete trusses to pass through them, were put up on each bank and these supported two $1\frac{3}{8}$-in. plough steel cables across the gap. The northern half of the bridge was built complete on the bank and lifted out bodily in one piece, its forward end supported by the cables and dragged by a tackle attached to a hoisting engine. The shore end ran on ground rollers. When the forward end was out far enough it was fixed to the cables and the hauling tackle then picked up the shore end and lowered it into position on its bearings. The two trusses for the southern half were launched separately and were supported by the cables until the centre pins were in position ; the laterals and bracing were then fixed. Erection of the superstructure started at the centre and was kept progressing equally outwards.

The bridge required about 90,000-ft. board measure of timber. As this and other structures on the same road used up 500,000-ft. board measure in all it was possible to afford a 35-H.P. saw mill on the site which could turn out 4,000 to 6,000 ft. per diem.

The bridge was constructed under the supervision of Francis G. Sommer, division engineer of the California State Highway Commission, of which Austin B. Fletcher is chief engineer. This description is based on an article in *The Engineering News-Record* (New York), Vol. 78, No. 12, dated 21st June, 1917.

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THREE-HINGED TIMBER ARCH, 150FT SPAN.
CALIFORNIA STATE HIGHWAYS. BUILT, 1917.
Rise 42'. Panels 10' long horizontally.
Trusses 15' apart at centre pin and 28' apart at the foundations.
Roadway 18' wide.
Loads allowed for:
100 lbs per Sq. Ft. and a 15 ton vehicle, 10 and 5 ton
axle loads on 10' Wheelbase.
Material: Redwood.

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## *CHIRIQUI RIVER SUSPENSION BRIDGE, 410-FT. SPAN.*

*By* MAJOR V. P. SMITH, R.E.

THIS bridge has no particularly novel features but being of considerable span and an example of recent American practice it may claim some attention. The River Chiriqui is in Panama and this structure, just completed, is to take a wagon road across it. The river bed is ful of large boulders, it slopes about 150 ft. to the mile and the velocity of the current sometimes reaches 20 ft. per second, so the construction of piers would be a difficult matter. Floods have been known to cause a rise of water level of 15 ft. in a few hours. The construction of a two-span suspension bridge on the same site was commenced by different engineers in 1909, but the scheme was abandoned after a heavy flood had washed out the central pier.

The present bridge is designed to take a 10-ton road roller or a drove of 50 cattle. All material required for the bridge had to travel the last $7\frac{1}{2}$ miles over a bad road.

The drawings explain themselves. No measured drawings of the towers are available but these appear to have been made up of 8-in. broad-flange I-beam posts with angle-steel bracing, all field joints being made with bolts. The posts, 42 ft. long over all, were sent up in two pieces.

"The most difficult transportation item," it is stated, "was moving four $2\frac{1}{2}$-in. cables, each weighing with end sockets $4\frac{1}{2}$ tons including the reel. To haul the cable reels over the $7\frac{1}{2}$ miles with safety it was found necessary to strengthen the floor system of a 230-ft. suspension bridge, to build several culverts, and to repair the wagon road." This is a curious statement as it stands for it is well known that cables have been transported frequently over the most difficult country and the lightest of bridges by the simple expedient of taking them off the ree's and distributing the weight on a string of carriers or animals. The use of cast iron for the clamps does not seem very sound for they are exposed to shocks and some transverse stress.

The bridge was calculated to have a camber of 3 ft. but it actually settled down to 2 ft. As is usual a guess had to be made as to the amount to be allowed, in addition to the camber, for the stretch in the cables. The designer does not say what the allowance was.

The bridge, subject to some modifications by the American Bridge Company, was designed by A. S. Zimn, Consulting Engineer to the Republic of Panama. The information given here comes from an illustrated article in the *Engineering News-Record*, New York, Vol 78, No. 9, dated May 31st, 1917. The plans have been redrawn for this article by Sapper W. A. Johnson.

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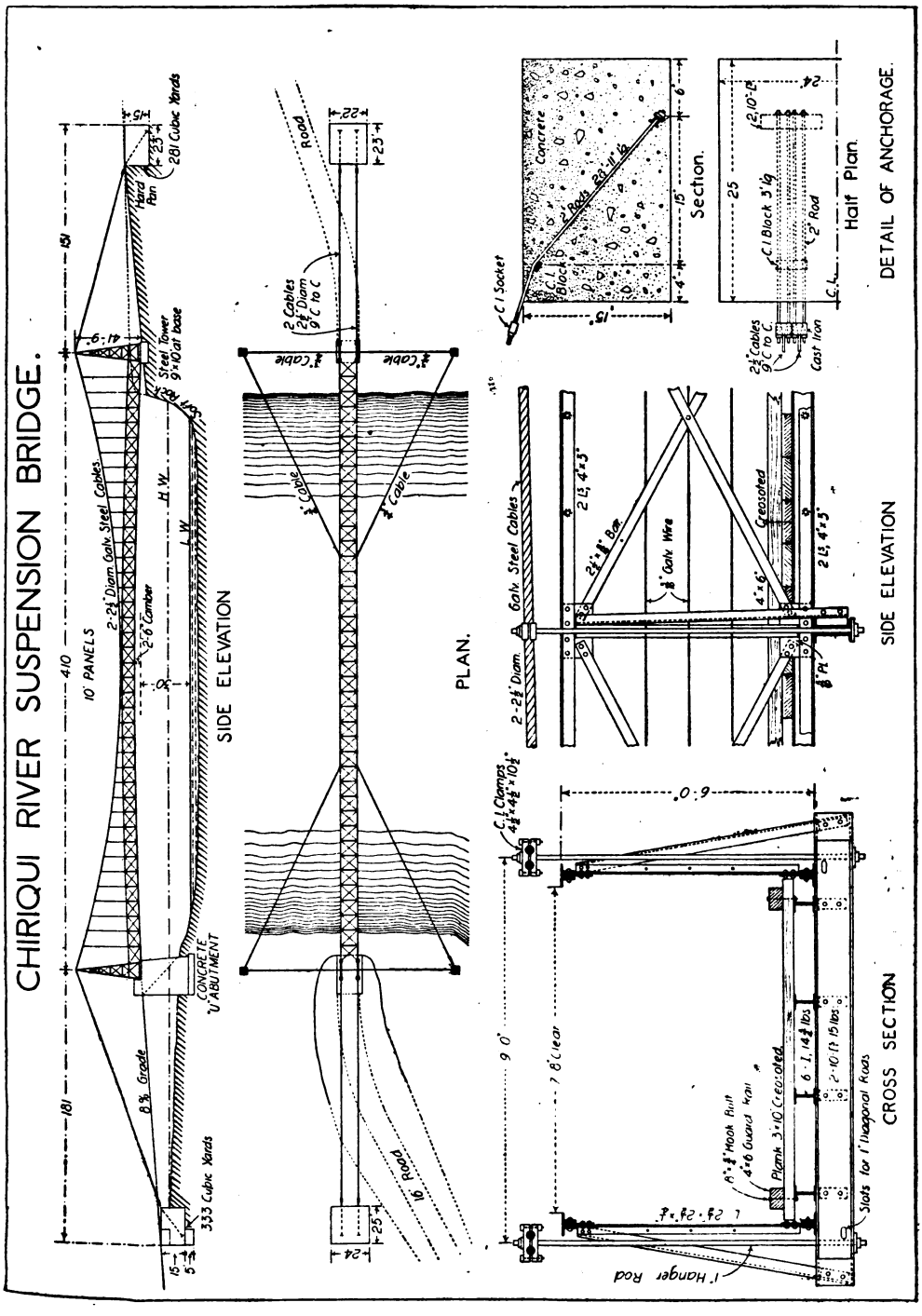


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# *A FIELD COMPANY, R.E., AND DIVISIONAL FIELD COMPANIES, R.E., ON THE LINE OF MARCH.*

*By* LIEUT.-COLONEL ARTHUR A. CROOKSHANK, R.E.

## FIELD COMPANY VEHICLES AND LOADS.

*Wagons and Loads.*—The following three lists show the loads per draught animal arranged in order of magnitude :—

*A*. Dead or useless load per animal. Empty vehicle only

| | lbs. |
|---|---|
| 1. Water Cart .. .. .. .. .. | 711 |
| 2. G.S. Limber .. .. .. .. .. | 606 |
| 3. Tool Carts .. .. .. .. .. | 557 |
| 4. R.E. Limber .. .. .. .. .. | 532 |
| 5. G.S. Wagon .. .. .. .. .. | 462 |
| 6. Bridging Wagon .. .. .. .. | 350 |
| 7. Pack Animal .. .. .. .. .. | 64 |

*B*.—Live or useful load per animal. Load only (exclusive of vehicle). Loads as per Field Service Manual.

| | lbs. |
|---|---|
| 1. Trestle Wagon .. .. .. .. .. | 655 |
| 2. Water Cart .. .. .. .. .. | 620 |
| 3. Pontoon Wagon .. .. .. .. | 575 |
| 4. G.S. Wagon .. .. .. .. .. | 524 |
| 5. R.E. Limber .. .. .. .. .. | 482 |
| 6. Tool Carts .. .. .. .. .. | 465 |
| 7. G.S. Limber .. .. .. .. .. | 330 |
| 8. Pack Animal .. .. .. .. .. | 166 |

No. 5 includes 50 sandbags, 43 blankets, 210 lbs. of explosives, 35 lbs. section officers' kit, 58 lbs. of cordage, 63 lbs. of grindstone, 23 lbs. hose, 14 lbs. nails, 24 lbs. chest pack, 110 lbs. ground sheets, 18 lbs. horseshoes, etc.

No. 7 includes all cooking utensils, 18 dixies, 217 rations, etc.

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*C.*—Total load per animal (weight of vehicle plus articles loaded as in Field Service Manual).

| | lbs. |
|---|---|
| 1. Water Cart (full of water) .. .. .. | 1331 |
| 2. Tool Cart .. .. .. .. .. | 1022 |
| 3. R.E. Limber .. .. .. .. .. | 1014 |
| 4. Trestle Wagon .. .. .. .. .. | 1005 |
| 5. G.S. Wagon .. .. .. .. .. | 986 |
| 6. G.S. Limber .. .. .. .. .. | 936 |
| 7. Pontoon Wagon .. .. .. .. | 925 |
| 8. Pack Animal .. .. .. .. .. | 230 |
| Water Cart, half filled .. .. .. | 996 |

The following vehicles appear high up in the three lists :—

| | Average Place. |
|---|---|
| 1. Water Cart .. .. .. .. .. | 1·33 |
| 2*a*. Tool Cart .. .. .. .. .. | 3·66 |
| 2*b*. Trestle Wagon .. .. .. .. | |
| 4. R.E. Limber .. .. .. .. .. | 4·00 |
| 5. G.S. Wagon .. .. .. .. .. | 4·66 |
| 6. G.S. Limber .. .. .. .. .. | 4·76 |
| 7. Pontoon Wagon .. .. .. .. | 5·33 |

The points to be noted are :—

(1). The water cart if full of water, should have at least two pairs of animals. If only one pair is available, the cart should not be more than half full.

(2). Freak or non-regulation loads should never be put on to the water cart, tool cart, trestle wagon, R.E. limber, or G.S. wagon.

(3). The pontoon wagon and the G.S. limber are the only wagons which, on paper, can have any extra or non-regulation load added. This extra load should not be allowed in the case of the pontoon wagon as there are other factors to be considered, namely the great height and length of the load which makes it an unwieldy and difficult load to pull, also to drive, and wind pressure on this large and high surface appreciably increases the drag on the animals.

The vehicles most likely to "break up" are the R.E. limber (rear wagon) and the bridging wagons. In the case of the R.E. limber the expanded metal in the sides should be removed, and replaced by sheet iron. This vehicle sometimes gets its back (or floor) broken by uneven or bad loading or overloading and bad balancing. This vehicle should be replaced by a G.S. limber as soon as opportunity occurs. The latter is a far more serviceable vehicle, and it is a mistake to have "freak" vehicles in the service (far better to standardize). Also the G.S. limber being all wood is much easier

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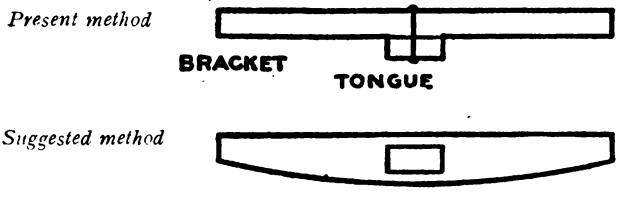
to repair on field service than the R.E. limber which is all metal. The forewagon can be used separately as a two-wheeler, and is handy for local traffic of small loads about camp and near works, also for fetching rations, letters, parcels, clothing, etc. The forewagon of the R E. limber is a useless type of vehicle, very heavy for the load it carries (*i.e.*, the useless or dead load is excessive in proportion to the useful or live load).

As regards the bridging wagon, this vehicle is badly designed and under-scantlinged in places; parts of the wagon are likely to "give" owing to the above reason, and also because under conditions of motionless warfare, this wagon spends 90 per cent. of its time as a contractor's wagon for carting about building materials. This means that it is loaded in a way it was never intended to be, and that some of its members are subject to stresses they were never designed to take.

The members which most frequently fail are the main cross-brackets, the long runners and the turn-table fittings; these "give out" owing to being under-designed.

When they do so they should be re-designed after working out the stresses, and rebuilt to much heavier cross-sections. The main cross-bracket also fails because the bolthole is bored far too close to the end of the cantilever arm; this causes the ends to split and open up. When rebuilding the arm, it should be designed longer and with iron strap reinforcement and of heavier cross-section.

The after-bracket over the turn-table is not strong enough for the strains which are brought to bear, when going over uneven ground, owing to the fact that the pole is fixed. It can be strengthened by cutting it out of limber 6 in. deep, tapering it to the ends, and fixing the short tongue into a mortice in the middle of its depth.




The box requires to have two wooden partitions put across it; the top edge of each partition is grooved to fit two of the driver's carbines lying on the flat and to hold them firm. Leather straps should also be fixed to the sides of the wagon to hold the carbine of the third driver and the rifle of the brakesman.

The bearings (*i.e.* points of contact of support between the wagon and the load) nearly always want altering in the pontoon wagons; wedges of hard timber held by long screws or by iron straps (or by both) should be placed on top of the bearing blocks so as to give

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continuous contact between the bottom of the pontoon and the block, and to fit accurately the space between. Pontoons, especially the bow section, are liable to slight distortion and to assume peculiar shapes; each wagon should therefore always carry the same pontoon.

In the case of the trestle wagon these wedges are much larger affairs, especially in the fore-bearing blocks, as the latter are made to fit the lines of the bow of the pontoon and are sloped up considerably. The result is that the baulks and ribands become long and heavily loaded beams, supported at both ends only and without any intermediate supports.

*Cart Covers.*—All vehicles having cart covers (G.S. or technical wagon, R.E. limbers, tool carts and G.S. limber), should be provided with arched ribs, which are best made of tee iron of small cross-section. The tool cart should have a flat arch, and the open wagons a high semi-circular or elliptical arch. The bridging wagons (especially the pontoon wagons), might also be provided with ribs, and with improvised cart covers (made up out of canvas in the company workshop). The advantages of this arched roofing are:—

(1). Rainwater is thrown off at once, instead of lying about in pools in depressions on the top of the load.

(2). The life of the cart cover is prolonged.

(3). The wagons look smarter and, when together, the column looks more symmetrical and more uniformed.

(4). Best of all—a limit is put to the amount of load which can be heaped upon a wagon, *i.e.* overloading and freak-loading is defeated.

(5). The vehicles, when empty, can be used as bivouacs.

(6). The company and divisional conventional signs can be better painted on both near and off side, and look much nicer when done.

*Brakes.*—The brake in the bridging wagons should be re-designed and re-made; it is very clumsy, and difficult for the brakesman to get at; the shank is weak and unsupported for too great a length; it soon develops "play," and finishes up with only a small portion of the surface of the brake in action on the tyre of the wheel.

It would be better to have a brake of a totally different type, *i.e.* the pattern on the tool cart, but as this is not easy to arrange, the brake, as it exists, should be stiffened and strengthened by diagonal braces. The brakesman's pack should be carried for him unless the tool cart pattern brake is fitted.

*Wheels.*—The wheels of the bridging wagons should be replaced by artillery wheels on the first opportunity that occurs.

## A Field Company, R.E., on the Line of March.

The average mule supplied to the field companies is a hardy and sure-footed animal and makes an excellent pack animal, but nature never intended it to be a draught animal; it has not the weight, bone, muscle, nor the breadth of chest or of quarters for the purpose.

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It often occurs that the greater the number of pairs hitched on to a wagon, the less the result on the movement of the wagon, due partly to the mules (also drivers), not being sufficiently trained, also to some of the mules pulling in different directions and the remainder not pulling at all. It is therefore better to break the double tool carts and drive them singly in order to get the best value out of the mules.

Trouble on the line of march nearly always occurs with the four-wheelers. When this is due to the steepness of the road, or to a short length of bad surface, it is usually better to man the drag ropes; if this fails, then take off part of the load and get over it light.

It should be remembered that a field company, R E., consists of three parts having different rates of progression on the line of march; namely, the two-wheeled vehicles, which do say 5 miles an hour, the four-wheeled vehicles 4 miles an hour, and the men and pack animals, 3 miles an hour.

The best way to move a field company from one place to another by road, is to march each of these three component parts separately. This gets the best value out of each part, and allows each to move at its natural pace, and is more comfortable for all. It is certainly a mistake to have animals and vehicles sandwiched in between the dismounted sections as in the regulation march formation.

The two-wheelers, with the section vehicles kept together, and in the same order of march as the men, should be started off first, headed by the Assistant Company Adjutant and tailed by the mounted serjeant. The latter helps the Assistant Adjutant to decide (on reaching camp), how the picket lines are to be laid out and the wagons parked. The brakesmen can keep up and go the pace of five miles an hour if their packs are carried for them. The two-wheeler column arrives first in billets, and the cooks at once get to work on the men's meat meal. This enables the men to get their dinners quicker than they would otherwise.

The four-wheelers should start next, headed by the Company Adjutant and tailed by the mounted corporal and farrier-sergeant, and the remainder of the mounted section.

Last of all the four dismounted sections with the four pack animals together, in the rear, headed by the C.O. and tailed by the next senior officer (not with the first two columns). The men march far better if they are all together as a solid mass of men. When the section officers are not riding, their horses should be placed behind the pack animals. This should be done at a halt so as not to break the column on the line of march. In hot or dry weather the water cart can be sent with the four dismounted sections, taking position behind the four pack animals.

Four men for message work (cyclists) go with the two-wheelers (two at the head and two at the tail of the column). Four cyclists

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similarly with the dismounted sections. Eleven cyclists (two per dismounted section and two for the headquarters and mounted section, under an N.C.O.) go ahead as billeting party. They take cooking pots and have hot tea ready for the men on arrival. The remaining fourteen cyclists go with the four-wheelers as escort (see para. 4) in case of trouble on the line of march.

### Divisional Field Companies, R.E., on the Line of March.

When two or three field companies of a division march together as a formed body of Divisional Field Engineers, a similar formation is adopted, *i.e.*, three separate columns (two-wheelers, four-wheelers, and dismounted men) in the same order of march as the companies. In the two-wheeler column, the first company portion will be headed by the Assistant Company Adjutant and tailed by the mounted sergeant, the last company portion will be headed by the mounted sergeant and tailed by the Assistant Company Adjutant.

The four-wheeler column will be in a similar formation, *i.e.*, headed by the Company Adjutant of the leading company and tailed by the company adjutant of the last company.

The Regimental Medical Officer (M.O., R.E.) comes last of all (behind the men's column) with his N.C.O. orderly and red-cross Maltese cart, also the Chaplain, R.E. These two officers attend to march casualties. The Veterinary Officer, R.E., is also with this party, and attends to march casualties of animals.

### C.R.E. and Headquarters, R.E.

The C.R.E.'s and Headquarters, R.E., wagons (two G.S. limbered wagons) are attached to one of the companies (remaining with the same company all the time) and march at the rear of the two-wheelers of that company, accompanied by one of the C.R.E.'s three cyclist orderlies (one borrowed from each company). The whole column is headed by the C.R.E. who has with him his adjutant and regimental sergt.-major, also one cyclist (of his own) and one from each field company, for message work on the line of march, also the C.R.E.'s and adjutant's mounted orderlies. The C.R.E. thus has, for message work on the line of march, four cyclist orderlies and two horse orderlies.

The C.R E.'s advanced billeting party consists of the Divisional Field Engineer, the Engineer Clerk, one cook, and one of the C.R.E.'s three cyclists. All the above (except the D.F.E.) would be on bicycles; tea is prepared on arrival as previously mentioned.

The French Interpreter, R.E., goes ahead on a bicycle the afternoon before; he allots an area to each field company. The leading company on the line of march gets the furthest area, on the far side of the village (or R.E. area); the rear company gets the nearest billets.

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## ARRIVAL AT THE END OF THE MARCH.

### THE TWO-WHEELER COLUMNS.

About 200 yards before reaching billets the two-wheeler column is halted. The first company portion advances alone, and is met at the entrance to the village by the officer, N.C.O., and five cyclists of its advanced billeting party, the remaining five cyclists being engaged in getting hot tea ready. The R.E. limber of each of the four sections is then pulled out of the column and guided to the section billet by the section guide; the G.S. limber (or cooks' cart) similarly to the Headquarters' and mounted section billet. The articles required for the night are offloaded and the teams are then led away to the horse lines leaving the vehicles with the sections for the night. The five cooks then at once get to work on the men's meat meal.

The water cart (if not with the dismounted sections column, as previously stated) goes to the best drinking water in the neighbourhood and then calls at each cookhouse in turn (seven messes, *e.g.*, officers', sergeants', headquarters' section and mounted section, and four dismounted sections).

The eight single tool carts close up on the road, and are guided to the wagon lines direct.

The Assistant Company Adjutant, with the mounted sergeant, lay out the horse lines and wagon lines, and find out about horse watering places.

As soon as the roads are clear of the first company, which has gone through the village to its billets on the far side, the two-wheelers of the second company advance from the halting place outside the village (in the same way as the leading company) to their billets in the centre of the village.

Similarly the third company moves to billets on the near side of the village directly the second company is clear. When the column arrives at the halting place outside the village the Assistant Company Adjutant of the third company moves up to the head of his two-wheelers, and the mounted sergeant drops back to the rear of the column.

The order of the march in the two-wheeler column of each company is the R.E. limber, then the tool carts of the leading (dismounted) section on the line of march, headed by and under the charge of the mounted N.C.O. of the section, then the two-wheelers of the other three sections in order of march, then the G.S. limber (or cooks' cart) and last of all the water cart (if not with the dismounted sections).

The Officers' Mess cart follows behind the two-wheeler column, keeping a respectful distance from it and trying to look as if it did not belong to it (being a non-regulation or outcast vehicle).

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## The Four-Wheeler Column.

The four-wheeler column when it approaches in due course of time (it sometimes arrives long after the dismounted sections column) is halted outside the village, in the same way as the two-wheeler column.

The order of march of each company portion is G.S. wagon (or technical wagon), trestle wagon, No. (1) pontoon wagon, and last of all No. (2) pontoon wagon and the spare animals.

On arrival at the above halting place the technical wagon of each company is taken by the headquarters' section guide to company headquarters. The few things required for the night are offloaded and the team goes off to the horse lines.

The bridging section four-wheelers of the leading company go straight to the horse lines from the halting place; directly the first company wagons are parked the second company follows; similarly the third company.

When the third company arrives at the halt outside the village, the Company Adjutant moves up to the head of his company portion and the mounted corporal drops back to the rear.

The Company Adjutant is sent with the four-wheelers and not with the two-wheelers. It would be a good thing if he could move with the latter and arrive first in camp in order to lay out the wagon lines and horse lines, but the Assistant Adjutant can do this well enough with the help of the mounted sergeant; the Company Adjutant is more wanted with the four-wheeler column, as the latter is the only column that is likely to give serious trouble on the line of march. If the country is hilly and the roads have steep gradients or sharp turns or a soft or rough surface, or if they are slippery owing to rain, snow or ice or nature of covering (cobbles, concrete, wood blocks, etc.) or flooded, or if it is dark, then it is no easy matter to get the trestle and two pontoon wagons through the day's march. The technical (or G.S.) wagon very seldom gives any trouble. Indeed the four-wheelers often arrive hours after the remainder of the company, and sometimes they do not arrive at all (until the next day). The line of march should invariably be reconnoitred the day before, if possible, or at any rate by cyclists sent some hours ahead, and previous preparations should be made for tackling the bad parts. These cyclists will also find out all places where horses can be watered during the march, and send back reports about them. It will often be necessary to send the four-wheelers by a totally different road to the rest of the company, in fact the two-wheelers sometimes use one road, the four-wheelers a second and the dismounted section a third road; each column going by the road which suits it best.

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## THE DISMOUNTED SECTIONS COLUMN.

The dismounted column is halted outside the village at the same halting place as the other columns.

On arrival at this halt the column is met by the guides of the billeting party. The first company then moves forward alone, and when it arrives near its billets, each section is led away separately to its billets by its section guide. The men are immediately served with hot tea, which they help out with the remainder of their mid-day feed (or haversack rations), the hot tea having been got ready by the advanced billeting party. After settling down in billets the men have their meat meal, rations having arrived early with the two-wheeler column in the R.E. limber (or forage cart). The section cook either comes on ahead on a bicycle as one of the advanced billeting party or as brakesman to the R.E. limber. Each section officer must remain with his men until he has done everything that is humanly possible to make his men comfortable, and similarly the Company Adjutant remains with his drivers and animals. The C.O. looks after the Headquarters' section, and later on goes round all billets.

The section pack animal is offloaded at the section billet, as some of the tools (picks and shovels at any rate) will probably be required for making a latrine, also a refuse pit, and for cutting up wood for the cookhouse, etc.

## C.R.E. AND HEADQUARTERS.

The C.R.E. (with his headquarters) should arrive early at the starting point, look down the column and get all the various units in their proper places, leaving 50 yards interval between the three columns. All the three columns start together. The C.R.E. then rides ahead shortly before the time of starting, and finds a place by the side of the road about a mile ahead, from which he can get a good view of the column; a bend in the road or the bottom of a long straight down slope is the best place to stand. At the first inspection on the line of march the C.R.E. takes the near side of the column and the Adjutant the offside; at the next inspection the C.R.E. and Adjutant change sides. The O.C. of each company column falls out in the usual way after saluting and remains by the side of the C.R.E., who points out anything not up to standard as regards march discipline, turn-out of men, animals and wagons, saluting, etc., fitting of harness, loading and balancing of wagons, etc. The C.R.E. points these out also to the O C. of the company when he joins C.R.E. later from the head of the dismounted column. Each column in turn salutes the C.R.E. once only on the line of march, at his first inspection, each company portion saluting separately. After that the officers only salute.

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The column takes about 14 minutes to go by. When it has passed, the Adjutant reports to the C.R.E. anything he has noticed wrong on the other side of the column.

The C.R.E. sees the column go by again about half-way through the march. He then goes on ahead so as to reach billets well before the leading column of two-wheelers. He is met by the Interpreter, R.E., who shows him roughly the area allotted to each field company, the position of the horse lines, Officers' Mess, and orderly room of each company, also of headquarters. The C.R.E. inspects any of these he is doubtful about, and inquires about water for both men and horses. It is sometimes necessary for him to make alterations. The important thing is that the first company on the line of march should be allotted billets on the far side of the area (*i.e.* should march right through the area to the other side) and the last company billets on the nearest side of the village. The C.R.E. should have a good Officers' Mess as he may have to offer hospitality to the G.O.C. or to senior officers of the division. He should also have a good office as he may be visited by the above officers, also by the Chief Engineer; and he may want to have conferences of his company commanders. In addition he usually has a lot of office work to do.

The notes made by the C.R.E. and his adjutant on the line of march are either sent out to each company, or the C.R.E. discusses them with his three company commanders at a conference—the same evening. At the same time the C.R.E. discusses the next day's march, the starting point, and best places for halting the men (both short and long halts) and for watering animals, steep gradients, and any bad places on the road where there is likely to be trouble with the four-wheelers. When the march is a short one engineering reconnaissances, exercises and schemes (such as destruction and reconstruction of bridges, roads, water supplies, and observation posts, defence of villages, etc.) can be done *en route*.

## March Comforts.

Each section should have the following:—

(1). A nest of five tin ablution basins, with square corners, packing one inside the other. These can be made in company workshops from old ration tins. A light portable fold-up wooden bench can be made for these basins. An ablution bench of this kind enables the men to have a comfortable and good wash immediately on arrival in camp.

(2). A "Dixie trough," *i.e.* an inverted trough of this cross section made of light sheet iron, and with holes into which the section dixies fit, as low down as possible, *i.e.* with only the handle rings showing above. This results in the men getting much better value out of their fuel, in great saving of fuel and in

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cleaner and more sanitary cooking. Better draught, quicker cooking and greater fuel economy are obtained by having two sections using the same cookhouse and joining two troughs together and making them into one. If a chimney or stove pipe can be improvised, fuel need only be put in and burned in a short length of one end of the trough.

(3). For a time I also tried carrying a light portable folding wooden box latrine seat of the flyproof type, and a light folding canvas screen to go round it, at the rate of two per section, but I gave it up because of its being (on the box seat of the fore wagon of the R.E. limber), so near to the meat and rations in the rear wagon of the same vehicle. But there is no objection to it if some disinfectant is carried with it and the box well cleaned and disinfected before being loaded up. It certainly is a comfort to the men, and a good thing from the sanitary point of view. Men are more likely to use a latrine if it is a comfortable and clean one, and by this means they can have the latter within a short time of arriving in camp.

(4). The mounted section should have two small horse troughs about 6 ft. long each of this cross-section __/, made of sheet iron, and to pack one inside the other; four light wooden portable trestles should be made to mount the troughs on. The hand pumps in the company equipment are used for filling these troughs, which are a comfort to the horses and enable them to be watered quickly and cleanly both on the line of march and immediately on arrival in camp. They are a protection against diseases which are sometimes picked up in publichouse water troughs.

The troughs can also be used as mangers, especially for savage feeders, *i.e.* for the type of animal that considers nosebags and haynets as part of the menu.

It may be remarked, *en passant*, that manger feeding should always be arranged if possible, and mangers should be built if the company is staying any length of time in one place or if the horse lines are likely to be used by other units subsequently. Without mangers a considerable portion of the feed is wasted, especially with mules.

If a company is staying more than one night the following should be made:—(1). An oven, out of oil drums. (2). An incinerator for burning camp refuse.

If transport is available a small portable boiler is a useful thing to have. It is useful on the line of march, also for giving men hot tea for their midday feed (or haversack ration) when on works. Hot tea on works at half shift time should always be arranged if possible, especially on night work, as it is a great help to the men, keeps them warm and fit and increases the output of work during the second half-shift.

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## Tool Cart, R.E.

The packing of the tool cart is a much discussed and vexed question. It is probably the heaviest load in the Army weighing 1,022 lbs. per animal, and its correct balancing is important. One method of packing is to put all the most frequently used tools (wood-working and a few metal-working) into one cart, and the less frequently-used tools into the other. The latter can then be put on one side.

If the company is likely to be suddenly called upon to turn out a small detachment (half a section) for isolated work, it is better to pack both carts exactly the same way, so that one can be sent off at once with a pair of horses, the most frequently-wanted tools being packed where they can be most easily and quickly got at.

Each section should have the tools, etc., carried outside the tool cart arranged in the same way, for the sake of symmetry and uniformity on the line of march.

## Pack Animals.

A small wooden box should be made to carry the guncotton slabs. The box should be made narrow so as to lie at the bottom of the leather saddle bag.

## Trestle Wagon.

Two small wooden boxes should be made to carry the differential tackle, to keep it clean and to enable it to be easily found.

The mounted section should have :—

(1). Horse water troughs (as already stated).

(2). Eight picket line posts. These posts are for three picket lines —one line for section horses, a second line for headquarters' section horses, and a third line for officers' chargers, horse hospital and for bad characters (kickers, etc.). The posts should be made of 4 in. × 4 in. deal, the square corners bevelled off, the post then covered with small mesh expanded metal, and the edges pinched into a vertical groove in the post. The top of the post is bound with flat iron or plain wire, to prevent fraying when it is being mauled into the ground, and the bottom pointed (chisel point) and shod with iron. A hole is bored horizontally through the top of the post to take the picket line, which should be of thin wire cable or two or three-strand plain wire.

When finished the post is tarred over. Picket lines should never be made fast to any of the company vehicles, or to live trees, as mules will ruin both in a very short time.

These posts enable the horses to be tied up in neat and regular lines immediately on reaching camp.

The wagons should also be packed in neat, straight and regular lines ; two-wheelers in one part of two lines, the two-wheelers (*i.e.*

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the eight single tool carts) in two or four lines according to the ground, and the four-wheelers (*i.e.* the three bridging wagons) in one line, the remainder of the company vehicles being in billets with their sections. Each wagon should be driven right on to its position in park—it should not be necessary to alter it later. Soft ground must be avoided for the bridging wagons; otherwise they will sink in during the night and cause trouble and delay when starting next morning. If firm ground is not available for the bridging wagons, they should be packed on the side of the road.

On arrival in camp all vehicles must be washed clean, bearings greased by the brakesmen, and all inspected by the company wheeler, also by section officers, any damage done to be reported at once to the O.C. and all march casualties (to men, horses or vehicles) together with hour of arrival and address of company headquarters (for messages) should be reported as soon as possible to the C.R E.

In order to look well on the line of march each column should arrive early at the starting point. The officer in charge should then go along the column and tidy up any men, horses or vehicles that require it, especially those horses which are in the habit of rolling in the mud after being groomed.

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## *HORSE WATER TROUGH.*

*By* LIEUT.-COLONEL A. A. CROOKSHANK, R.E.

IF sheet iron is not available the trough can be made of corrugated iron rolled out flat in a machine or beaten out flat with mallets. This labour is justified, as the flat sheet gives larger water capacity and better joints at both ends of the sheet.

The two longitudinal 4-in. × 1-in. timbers act as longitudinal braces and also prevent animals from getting their feet into the central drain (surface water) or from bumping into the sides of the trough. The joint between sheets should be fitted with waste steeped in red lead. The joint between the iron sheet and the wooden end should be as sketch, *i.e.* chase cut in board to be filled in with waste (steeped in red lead). Interior of metal trough should be painted white; exterior to be tarred. The following also are tarred:—(1). The top horizontal rails. (2). All woodwork below ground level and up to 9 in. above ground level. The top horizontal rails to have plain wire stapled to the upper surface also to the outsides as a protection against animals' teeth.

The drain under the trough can be made of old corrugated iron, fascine, or old planking.

On both sides of the trough, standing to be sloped down to central drain at 1 in 25, and floored with outside cuts of circular logs carried on bearers or biscuits of reinforced concrete, or brick on edge laid dry, or chalk covered with sand or coke, etc. If made of brick on edge or concrete slabs the floor to be broken up into squares or rectangles by a wooden framework thus :— ☐☐☐

The flooring must be made at least 10 ft. wide and a cattle fence 4 ft. high put up outside it. Openings to be left in continuation of the trough.

The standard size of trough will be a unit of two 7-ft. sheets; this being a convenient length for handling and for loading into a G.S. wagon, etc.

In places likely to be semi-permanent or permanent, the troughs can be joined together and built continuous (to full cross-section) in lengths of four, six or eight sheets. On temporary sites the trough

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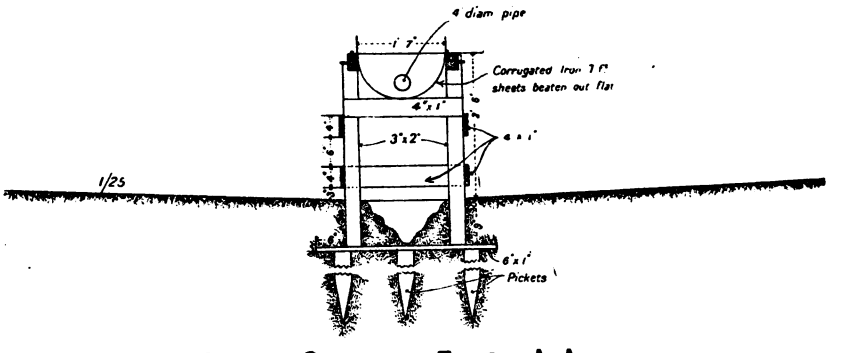
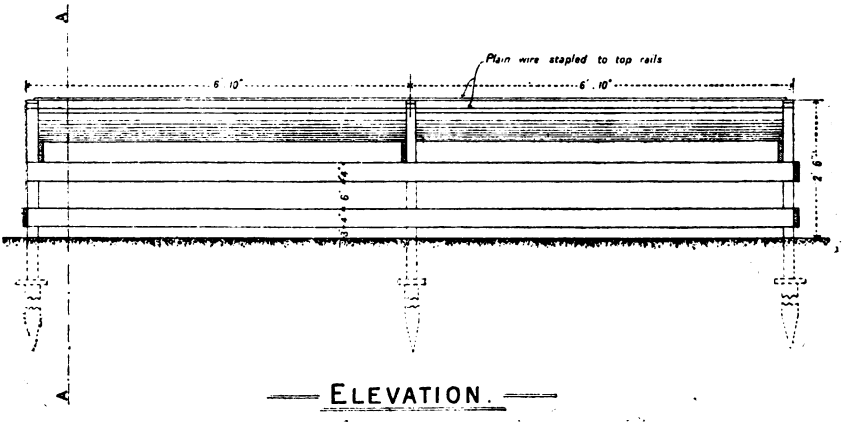
can be erected in standard units (two 7-ft. sheets long) connected by short lengths of 4-in. piping.

For close packing on vehicles the trough should be made up in three packages. (1). The trough only. (2). The four longitudinal braces of (4 in. × 1 in.) timber. (3). The three trestles. When making up into long continuous lengths (of full cross-section) the joints between the standard (two-sheet length) troughs should be made with gutter bolts. This enables the trough to be easily taken to pieces and re-erected elsewhere.




CROSS SECTION THRO. A.A.




ELEVATION.

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## *MORSE CODE DIAGRAM.*

*By* MAJOR A. D. ST. G. BREMNER, M.C., R.E.

THE diagram on next page was found recently in a Swiss handbook on the Prismatic Compass. It is believed to be an original method of presenting Morse Code signals in a graphical form and is quite ingenious. The diagram is apparently intended to make it easy for the uninitiated person to decipher the letters as they appear on the tape of the inker, but not *vice versâ*.

To use the diagram, suppose it is required to know what letter corresponds to the signal . — — Dots are represented by the dotted lines and dashes by the full lines. Commence at " Start " and as the first part of the signal in question is a dot, proceed upwards to E5 (as shown in circle on diagram), then for a dash proceed to the right through A1 (as shown in circle on diagram), and another dash gives the letter W as the answer. Similarly, for signal — — . proceed from " Start " to TO (as shown in circle on diagram), then to M (as shown in circle on diagram), and on to G as the answer.

Where both a letter and a figure appear in a circle together, the figure is of course the " short " numeral.

Another practical use is suggested and that is by issuing the diagram in blank, *i.e.*, without letters and figures inside the circles, the diagram could be made into the key of a cipher at any time by inserting the cipher letters and figures in their proper circle according to the signals representing them. Then the message as received could be decoded by an officer directly off the tape by means of the diagram. This might perhaps save some time according to circumstances.

Another advantage is that if other signs such as commas, or semicolons, etc., required insertion in the signal code, it is easy to invent the necessary signal by adding a circle in the obvious blanks on the penultimate top or bottom lines or even beyond these and joining them to the nearest lettered or figured circle on the next line by a full or dotted line as the case may be. In this connection it will be noticed that on the diagram, dashes are always drawn to the right and dots to the left.

Finally, the diagram might assist a beginner in learning the Morse Code.

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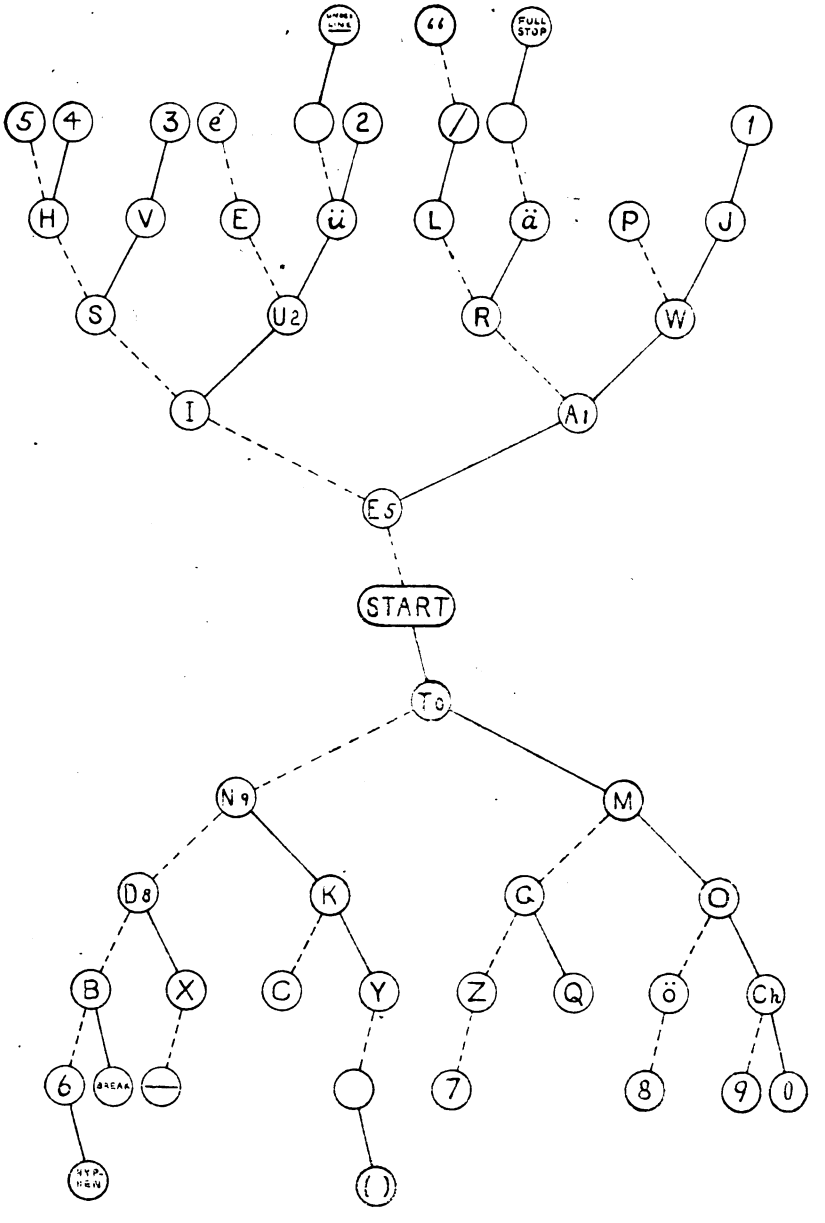


MORSE CODE DIAGRAM.

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## *CEMENT JOINTS FOR CAST-IRON WATER MAINS.*

MR. H. SHAW recently read a paper before the American Society of Civil Engineers, and we have been asked to reproduce the extracts below.

About 1886 a cast-iron pipe line for water distribution was laid with cement joints at Redlands, Cal., and in 1891 joints of that kind were used at Los Angeles, Cal., but evidently with questionable results, as the method was not adopted. In January, 1907, Mr. Charles Thornburg, then superintendent of one of the water companies operating in Long Beach, Cal., decided to try cement joints for a 16-in. cast-iron pumping main, and instructed his foreman of construction, Mr. F. M. Shrode, to conduct some experiments.

No definite process was outlined to the foreman, but his experiments and practice in repairing steel riveted water mains, under pressure, by using a dry mixture of neat cement in caulking the bands around these pipes, gave him an idea that a moist cement could be caulked into the bell solidly, and would produce the results desired. It was probably Mr. Shrode who, by this experiment, finally perfected the joint and used it in the construction of the entire line. When this line was completed and put into service, working under a static head of about 190 ft., several places showed some seepage, particularly at the lower end of the line, where the work was started, and it was decided to re-caulk these joints at the first opportunity; it was noticed, however, that the moisture was gradually drying up, and the seepage finally ceased.

Cast-iron construction was then abandoned by the company until 1911. During that year the works came into the possession of the municipality, and Mr. Shaw was appointed Engineer of the Water Department. After looking into the merits of the cement joint, as used on this 16-in. pumping main, it was adopted as the proper method of construction, and since that time it has been used throughout the entire system.

Long Beach now has 60 miles of cast-iron water mains, ranging from 4 in. to 24 in. in diameter, laid with joints of this type. All these pipes are under pressures ranging from 40 lbs. to 80 lbs. per square in., and are giving perfect satisfaction.

In making the cement joint the pipe is placed and spaced in the usual manner. A thin backing of the best dry jute is used instead of oakum, as the jute is free from oils and grease, which should be avoided. A Portland cement, conforming to the specifications

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advocated by the American Society for Testing Materials, is used. The dry cement is placed on a piece of canvas, usually a cement sack ripped open, and moistened with just so much water that when thoroughly mixed by hand the mixture will be of such a consistency that when gripped tight it will hold the form of the hand, and when dropped 12 in. it will crumble. The canvas containing the cement is placed under the bell, and the cement is tamped into place by hand with a caulking iron until the bell is about half full. It is then caulked with heavy blows until the cement is thoroughly packed in the back of the socket. This process is continued until the bell is packed solid out to the face. A small beading of neat cement in a plastic condition is then put round the whole joint, using the caulking iron as a trowel. As soon as the initial set of the cement in the beading has taken place, the joint is covered with earth to protect it from the air and sun. In back-filling, the excavated material is always settled with water, which helps to cure the exposed portion of the joint.

The beading is essential, in Mr. Shaw's opinion, as the cement packed in the bell is so dry that, without protection, it would absorb moisture from the water used in settling the trench, and he believes that, should the joint develop seepage when the pressure is put on in the main, the cement, being dry, would expand and aid materially in keeping the joint tight.

Experiments on cement joints constructed without the beading showed that 24 hours after completion they absorbed water readily. In cases where seepage has developed and has subsequently closed, it is assumed that the dry cement absorbed the moisture from the inside, expanded, and filled the seepage pores.

About 20 per cent. of the cement is wasted by falling off the canvas or being thrown out by the caulker. If any dust or earth from the trench falls on the canvas or in the cement, it is immediately taken out, together with enough cement to make sure that the remainder is clean. In mixing the cement with water, care is taken that there shall be no lumps in the material, no matter how small. If any cement is left on the canvas when the joint is completed, it is used on the next joint, provided the work is continuous, otherwise new batches are made. Special blunt caulking tools are used.

The joint is allowed to stand 48 hours before the pressure is turned on and the main is put into regular service. Cement joints have been used with satisfactory results, however, twelve hours after completion, but this is not considered safe practice. Pressure tests are never made by Mr. Shaw prior to putting a main into service.

At San Diego, Cal., a pressure test was made by caulking a 6-in. cast-iron tee, one side of the tee being filled with a plug and each of the two ends filled with short lengths of cast-iron pipe with plugs caulked in the ends. As the pieces of pipe caulked in the tee were scrap ends cut from other pipes, they had no bead on the joint end,

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and, notwithstanding the fact that the joint was made with smooth pipe, it took a pressure of more than 300 lbs. per square in. to force the pipe out. The test was made about 48 hours after the joint was made.

In another test, made at Winnipeg, Man., three lengths of 6-in. pipe were laid with four cement joints, on January 13th, 1916. After six days pressure was put on the pipe in increments of 25 lbs., and the joints were found to show no leakage or moisture up to 125 lbs. At 150 lbs. one joint showed moisture on the surface of the cement.

On January 24th another test was made, and at one joint moisture appeared at 175 lbs. On January 31st this joint showed moisture with 200 lbs., and also on March 15th, with a pressure of 255 lbs. This joint was the weakest of the four. The pressure was kept on the pipe about one half-hour in each case.

The strength and rigidity of the cement joint are shown by the following instances where cast-iron mains have been subjected to severe tests :—A new trenching machine was being tested by a sewer contractor in Long Beach, Cal. It operated parallel with and 5 ft. from a 6-in. cast-iron water main, with cement joints, which had been laid in January, 1915. The trench dug by this machine was 3 ft. wide and 18 ft. deep. Some time before noon on February 1st, 1915, the side of the trench next to the water main caved in, leaving about 40 ft. of the pipe hanging and supporting about 2½ ft. of earth on top of it. This condition was not reported until the next morning, and at 9 o'clock braces were put in to support the pipe. The main was under a pressure of about 65 lbs. per square in. at the time. There was not the slightest seepage from any of the joints as result of this strain.

Again, in June, 1915, 94 ft. of 4-in. cast-iron pipe with cement joints fell into a sewer trench, as the result of a cave-in under conditions similar to those just described. This pipe was under a pressure of about 55 lbs. per square in. At one end it broke at a service connection ; at the other end it broke near the spigot end of a pipe, about 8 in. from the joint, letting the whole 94-ft. section fall into the trench. In this case every cement joint remained intact. This line had been laid in March, 1913.

Several thousand feet of 8-in. and 10-in. cast-iron water mains with cement joints have been laid in made ground, the filling-in material being silt from the dredging of harbour channels ; also several thousand feet of 8-in. cast-iron pipe have been laid in fine beach sand ; all are giving perfect satisfaction. An 8-in. cast-iron main with cement joints was laid in filled ground—the soil being clay —with only 6 in. of covering above the pipe when the line was put in service ; the fill was then completed to 18 in. above the top of the pipe, and was rolled with a 14-ton steam road roller, without causing

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the slightest seepage in any of the joints. The rolling was done preparatory to paving the street in which the pipe was laid. This was a very severe test of the merits of the cement joint. At the time this rolling was done, had any seepage developed, it would have been readily detected, as the whole line was within 3 ft. of the edge of the fill. The fill was completed to a width of 80 ft., three months later, leaving the pipe 12 ft. from the centre of the street.

In several instances a cast-iron main laid with cement joints has settled 3 in., or probably more, in loose or filled ground, without developing any leakage. In fact, Mr. Shaw has only experienced one case in which the cement joint was not satisfactory. That was in a 6-in. cast-iron main in a dock, about 3 ft. from a railway line. Many joints in that pipe developed seepage, and some had small pin leaks, but the leakage was not considered serious enough to warrant closing down the line for reconstruction. This failure may be due, Mr. Shaw considered, to faulty construction, as the pipe was laid when the making of cement joints was in its infancy.

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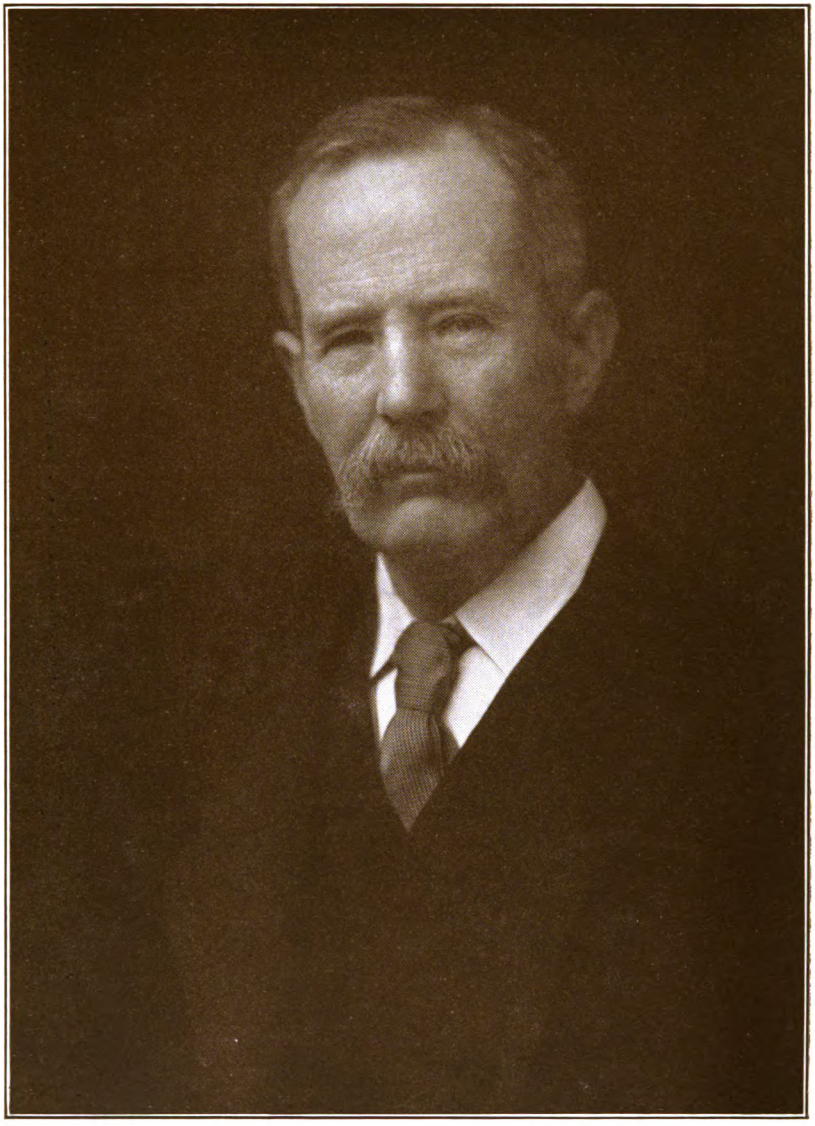

Colonel Sir Colin Campbell Scott-Moncrieff, K.C.M.G., K.C.S.I.,
Royal Engineers.

*From Photo by Mr. G. C. Beresford,*
*20, Yeoman's Row, Brompton Road, S.W.*

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# *MEMOIR.*

## *COLONEL SIR COLIN CAMPBELL SCOTT-MONCRIEFF, K.C.S.I., K.C.M.G., LATE R.E.*

On April 6th, 1916, Sir Colin Scott-Moncrieff died in his home at Chelsea in his eightieth year. His monument abides in Egypt, fashioned by himself during his lifetime after the manner of the kings who built the pyramids. But unlike the dead monuments of stone raised by the Pharaohs to house their soul-less bodies, his monument is the life-giving virtue that flows out of the work of his hands from generation to generation. The pyramids are high and can be seen for many miles around, but the living monument of our honoured dead is visible wherever you may happen to be in the land of Egypt from Migdol to Syene. Go where you will along the valley of the Nile, or within the bounds of the Delta, *si monumentum quæris, circumspice.* For the life of all flesh on the Nile is the water thereof, and the effective control of the water is the condition of the country's well-being. The Arabs who call the Delta Barrage "Kanatir-el-Khairiyah," the Bridges of Welfare, name it well.

Sir Colin Scott-Moncrieff made his reputation as an irrigation engineer twice over—first in India and afterwards in Egypt. His service as a soldier, beyond being on the Active List from 1856 to 1883, was limited to the Addiscombe and Chatham courses, and to four or five months' active service in the Oude Campaign at the close of the Indian Mutiny. While he was at Addiscombe the Crimean War was being waged—a war of special interest to Royal Engineers. During the period of his instruction at Chatham the Indian Mutiny broke out, and it was while it was still active, in 1858, that he went to India as a Second Lieutenant in the Bengal Engineers at 22 years of age. During the operations in Oude against the last remaining organized bodies of Mutineers he came under fire while acting as galloper to Colonel Brind, and was mentioned in despatches for his gallant conduct on that occasion.

After the Mutiny Moncrieff joined the Public Works Department of India, and began his irrigation career with two years' service on the Western Jumna Canal in the North-West Provinces. In 1862 he was appointed Assistant Principal of the Civil Engineering College at Roorkee and remained there till 1864. He then became Executive Engineer of the Eastern Jumna Canal under Major (afterwards

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General) Brownlow, R.E., as his Superintending Engineer. Colonel Western, R.E., who in later years followed Moncrieff to Egypt, was one of his assistants at this time.

Brownlow and Moncrieff were kindred spirits and became fast friends. They worked together most energetically and successfully for the good of India and its inhabitants. About this time irrigation had passed under a cloud. It was accused of not paying its way and of being an unprofitable servant to the State, even when it had done that which it was its duty to do. Through the combined efforts of Brownlow and Moncrieff the charge was disproved by the result of their labours, and the tide of public opinion in respect of irrigation was turned in its favour.

In 1867 Moncrieff took furlough, during which he examined on the spot the irrigation systems and administration of France, Spain and Italy, and, for result, published his book, *Irrigation in Southern Europe*, 1868—a work which made his name prominent among irrigation engineers.

On his return to India in 1869 he succeeded General Brownlow as Superintending Engineer of the Ganges Canal. The fact that he was chosen to fill a post of such importance, when as yet he was only 33 years old, shows that his superiors had already marked him as one fit for positions of great responsibility. To be in charge of such a division—300 miles in length from Hardwar to Cawnpore—was a grand experience for an intelligent and keen irrigation engineer. The Ganges Canal was a great object lesson to the irrigation world. The main canal works had been so designed and constructed that too high a velocity of flow was the result, and dangerous scour was consequently produced below the falls, threatening their stability. Drainage also had been neglected in the original scheme with baneful results. To remedy the defects on the main canal the falls had been remodelled in part before Moncrieff took charge, but he had to complete the remodelling of the remainder. He had also to correct the defects in alignment of the distributaries and elaborate the drainage system on sound lines. Perhaps no lessons are so instructive and convincing as those taught by the results of mistakes made by the student himself or by others.

Moncrieff had been for seven or eight years in charge of the Northern Division of the Ganges Canal when he was called away to other work. There was severe famine in Madras. There had been mismanagement in dealing with it, and, in consequence, a change of administration was decided on. Two Famine Commissioners were appointed—Sir Charles Elliot (afterwards Lieut.-Governor of Bengal) and Moncrieff. The former was charged with revenue questions and the administration of hospitals and camps where the people were fed; the latter was told off to devising and supervising the Famine Relief Works on which the needy were employed at a living

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wage, whatever their powers of work might be. The Special Commissioners had superseded senior men on the spot, so that a situation demanding the utmost tact was produced. Their work, moreover, was strenuous, it was spread over a wide tract of country, and much of it was of a distressing nature. But both men had their hearts in the work—hearts which sympathized with the suffering, the starving and the sick who had been entrusted to their care. The anxiety, responsibility and strain thrown upon the Commissioners was great. They laboured without ceasing amidst scenes of starvation, cholera, small-pox and other ills for two long years, until, at length, the angel that destroyed put up his sword again into the sheath thereof and the woe was past. The C.S.I. that was bestowed on Moncrieff as a recognition of his good work as Famine Commissioner was an honour fully earned.

In 1879 he resumed his work on the Ganges Canal, and then went on furlough for two years. On his return to India in 1881 he was made Chief Engineer of Burma. His work there was of a general nature, roads, public buildings, harbour works, lighthouses, etc. He retired at the end of 1882 and took passage for home early in 1883. But he failed to make the home port. Lord Dufferin, being well served by his Intelligence Department, waylaid him at Suez and captured him for Egypt.

Egypt was at a crisis in its history. In Nubar Pasha's words, Irrigation was the " Egyptian Question." To choose the right man to harness the Nile and handle the reins was therefore a matter of the utmost importance to Egypt. The fact that the choice fell upon Moncrieff shows what his chiefs thought of him and his works. He was not known to fame as the builder or designer of any prominent work of construction, such, for example, as the Solani aqueduct or any of the large weirs of India's rivers ; nor was his name connected with the initiation of any large irrigation project or sensational engineering work such as are the subject of newspaper articles that the public reads. But his work had been honest and thorough, his administration tactful and human, and his attitude towards the people of India patient and sympathetic. His subordinates knew him and called him an ideal chief. His chiefs knew him—knew him as an engineer to be relied upon and a man to be trusted. His work in Egypt has since shown how well they judged—or how well they were guided by a wisdom greater than their own—when they advised Lord Dufferin to secure him.

It was in May, 1883, that Moncrieff took charge of the irrigation of Egypt. He was at once confronted with the question of the system to be adopted for the irrigation of Lower Egypt. The expert advisers of the Egyptian Government had pronounced the Delta Barrage to be a hopeless and irredeemable failure, and had drawn up a project for the irrigation of the Delta by means of a huge system

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of pumping stations. Moncrieff wisely refused to accept the condemnation of the Barrage as final, or to express an opinion on the pumping project as an alternative, until after he had made himself acquainted with the existing state of affairs by travelling about the country during the summer of 1883. Meantime he gathered to himself from India his staff of assistants, of whom one of the first to arrive was Mr. (now Sir William) Willcocks. Moncrieff and Willcocks then—in 1884—commenced to study the Barrage and diagnose the weakness which was rendering it unfit for service. They discussed it and tested it. They took liberties with it and noted results. In 1885 they took more liberties without incurring the disaster their critics prophesied, but, on the contrary, securing much benefit to the cotton crop. They had proved that, with merely temporary expedients, the Barrage could be made to hold up water to an extent that hitherto had been assumed impossible. It was, therefore, decided to attempt a thorough and permanent restoration in order that the work might hold up a serviceable head of water. So the pumping project became a "wash-out," and not the Barrage. A loan of a million pounds was obtained for works of irrigation, of which the restoration of the Barrage, being by far the most important, was allotted the greater part.

The Delta Barrage—of French design and construction—is made up of twin regulators, one astride of either branch where the Nile at the apex of the Delta divides into the Rosetta and Damietta Branches. It was designed to raise the water level in the river to the height required to feed the main canals of the Delta taking off above it. It failed to do this when the attempt was made, because the foundation concrete had been recklessly laid in running water, and consequently the mortar, which should have compacted the floor and made it water-tight, was washed away. Hence, as soon as any head of water was produced by regulation of the waterway, the water found its way through the unfilled interstices of the concrete metal, and produced a scour of the river bed threatening to undermine the structure.

The permanent restoration work was entrusted to Colonel J. H. Western, R.E., with Mr. A. G. W. Reid as Resident Engineer. Together they made a most successful job of a difficult piece of work extending over five years. The best evidence of its success is the fact that the Barrage to-day—28 years later—is still doing its duty efficiently. It is the most important work in Egypt, not even excepting the Aswân Dam, as it controls the whole of the irrigation of the Delta. Moncrieff's bold decision to restore it has enriched Egypt to an extent that, if stated in figures, would seem incredible. It was while this work was in hand that Moncrieff received his K.C.M.G., and was henceforth known as Sir Colin, as he will be called in the remainder of this Memoir.

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During the same period of work on the Barrage, less ambitious reforms were being effected throughout Egypt by Sir Colin's staff of English Inspectors of Irrigation. Of defects, which it was their task to rectify, there was no want anywhere throughout the irrigation systems of Upper and Lower Egypt. The want in these early days was not work to do, but money to do it with. There was not enough to pay for even the absolutely necessary repairs and alterations, and to prevent things going from bad to worse. The country was on the verge of bankruptcy. But one thing—and that a matter of supreme importance—could be taken in hand without money, namely, the just distribution of water to rich and poor alike. The difficulties experienced, however, in this endeavour revealed the general chaos of the Irrigation Service. But it was because things were as bad as they could be that Sir Colin reckoned himself peculiarly fortunate. This is how, in later years, he described " the state of Egyptian irrigation when Arabis' revolt took place in 1882. The whole country was groaning under its burdens. The rich even were feeling the pressure, for the taxation was heavy, cotton had gone down in price, water was more difficult to get. Happy the reformer who steps in just when things are at their worst, when the people have lost hope of helping themselves. Happy the reformer that has a Governor or Government behind him with a backbone, and a will, and that sees he is left to carry out his views. Such happiness, such very unusual good fortune, fell to the lot of myself and the band of my Anglo-Indian fellow workers."

The backing he had from his chiefs he gave in like manner to those of whom he was the chief. Here again are his own words referring to those under him. " My function has been merely to fight their battles at headquarters, and to back them up through thick and thin, and insist that they were always right—in short to keep the wheels oiled." This is an example of how unassuming men of real merit book back seats for themselves. It may recall to those who heard it Lord Cromer's account of his own share of British influence in the government of Egypt. He likened himself to the man with the horn on the back of the coach, who makes the noise, while the horses—the British officials in the Government of Egypt—are doing all the work. It would have been a truer simile if he had made himself the coachman with the reins and the whip in his hand. The same simile would have been as true of Sir Colin, but without the whip : for he wanted no whip ; his team were all free goers.

But Sir Colin's function according to his own account was to be the Department's champion at headquarters and general lubricator. Though in his modesty he belittled his function, it nevertheless required a combination of rare qualities and a great deal more than engineering talent. Such qualities he had in full measure. Firstly, he had broad views. As was remarked of him by one who had

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official relations with him when he was Under Secretary for Scotland, "he put aside technicalities and approached matters from a common-sense point of view." He also had courage to incur risks when, in his judgment, it was the right thing to do. He was, besides, a just and capable administrator. He possessed good health, untiring energy and, as Sir Auckland Colvin puts it, "enthusiasm lit and sustained by the flame of duty." But something more still was wanted to win the battle at headquarters, where Khedives and Pashas, Native Ministers, Governors and Notables, Consuls-General, business men and merchants of all nationalities, bore down upon him, each with his own axe to grind. Sir Colin was no diplomatist or politician; he was disqualified for such a *rôle* by the possession of a character "transparently honest," as Lord Cromer describes it. But his transparent honesty combined with tact, his kindliness, unselfishness and modesty, served him better than the most expert diplomacy. The successful conduct of what he called his share in the irrigation work was due to the respect in which he was held by all kinds and conditions of men on account of his sterling and open character. It was the gift of charity, as defined by Paul the Apostle, combined with resolute firmness, that produced the "soft invincibility" which gained for him the victory in his warfare at headquarters. Charity never faileth.

There was, however, one long sustained battle which Sir Colin set his heart on winning, but which, at one time, he had given up as lost. He has himself stated that the work in Egypt which he had most at heart was not the restoration of the Barrage, but the abolition of the Corvée; his human sympathy was stronger than his professional ambition. He had not been long in Egypt before he realized what a monstrous system the Corvée was, and, thereafter, he never ceased his energetic campaign against it till it was finally abolished.

The Corvée, as it existed in Egypt, was a legalized system of forced and unpaid labour, designed to effect the clearance of the public canals and the repair of banks in the charge of the Irrigation Department. It was objectionable from the engineer's point of view as being a clumsy wasteful and inefficient instrument; from the philanthropist's as being a form of slavery. The poorest of the people were made to work at long distances from their homes without pay, rations or shelter; the wives and children had to see to the food supply from their own resources. If the workers slacked, they were speeded up by the "kourbash." Their lives were made bitter with hard bondage in all manner of service in the slimy mud of the canals and in the choking dust of the banks. The average number of men called out annually for the three years following the Battle of Tel-el-Kebir was equivalent to 234,153 men working for 100 days. Before Tel-el-Kebir who knows the numbers!

The system, if worked according to law, was bad enough; but,

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worked as it actually was with abuses to which it readily lent itself, it was an "abomination to the Lord." Sir Colin, as engineer and philanthropist, declared war against this evil thing. But there were many obstacles, financial and political, to overcome. The Native Governors of Provinces were against a change which would, or might, diminish their influence over the people; the Great Powers of Europe for various reasons opposed the reform; till, at length, Sir Colin felt that he could kick against the pricks no longer. Lord Cromer reveals in *Modern Egypt* that Sir Colin, though not easily provoked, was so maddened by the opposition he encountered at every turn that he resigned his post. The limits of long-suffering had been reached.

The difficulty was to find the money necessary to make it possible to substitute paid dredging and contract work for the unpaid labour of the Corvée. That this difficulty was ultimately got over was due to the results of the work done by the department itself over which Sir Colin presided. The chief of the works producing these results was the restoration of the Barrage. The raising of the river water level had made it unnecessary to clear the beds of canals to the depths to which the Corvée had been called upon to clear them, and so the quantity of work to be executed was much reduced. Decrease of silt deposits had also been brought about by a scientific regulation of discharges and flow in various canals. Further, useless work which, through ignorance of what was really necessary in irrigation work, had been included in Corvée programmes, was eliminated. Moreover, the reforms introduced in the service of irrigation had been so effective in promoting general prosperity, that the financial situation was vastly improved, and money for public works was more easily obtainable. It had been estimated that with a sum of £400,000 it would be possible to do all the Corvée work by paid and free labour, and Sir Colin assumed the responsibility of undertaking to do it for that sum. At first £250,000 only could be secured, and with the help of that amount the country was relieved of more than half the burden. At what stage of the negotiations Sir Colin resigned is unknown. But he had not been seeking his own, he had been striving for others, and for their sakes he allowed himself to be persuaded to endure till the end. And so he withdrew his resignation. Ultimately, after tedious negotiations, the full sum of £400,000 was obtained. The victory was won at last and the Corvée lay dead.

The restoration of the Barrage and the abolition of the Corvée were Sir Colin's most notable achievements in Egypt. But the organization of the Irrigation Department on sound lines must be reckoned high among the things that he accomplished; for its results have been lasting and cumulative, and still continue to develop. Of other less conspicuous but essential works there were many due to his controlling authority. During his time the drainage of Lower

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Egypt, which had been neglected or ignored, was taken vigorously in hand; a project for connecting the villages by agricultural roads was successfully undertaken, no roads of any sort existing before; the basin systems of Upper Egypt were remodelled on scientific principles; and countless restorations, renewals and repairs were effected everywhere throughout Egypt. As a consequence of all these measures and works of reform, the Irrigation Department, working under Sir Colin's direction, had, in a few years, been so successful in its endeavours that every drop of water in the Nile during the low season was utilized in irrigation, and there was none that ran to waste into the sea.

Notwithstanding this, the demand was not met and more water was wanted; the cropped area had increased as fast as more water was made available. So, in anticipation of the eventual removal of the financial and political difficulties which in those days stood in the way of all progress, Sir Colin appointed Sir William Willcocks to conduct the preliminary studies for a reservoir project, the ultimate outcome of which was the Aswân Dam.

In 1890, while still in the Egyptian service, Sir Colin, at the request of the Russian Government, went to Central Asia to give advice about the irrigation of Merv from the Murghab River. In 1892 he retired from the Egyptian service. From 1892 to 1902 he was Under Secretary for Scotland. In 1901 he was selected chairman of the Indian Irrigation Commission, and as such visited India during two successive winters. This may be looked upon as the final act of his irrigation career. In recognition of the valuable service rendered to the Government of India on this Commission he was awarded the K.C.S.I. Thus, after 45 years of good and faithful service to the State and to the people in India, Egypt and at home, he retired at last from work, full of honour, and, better far than that, sure of having won for himself the Master's satisfied: "Well done."

HANBURY BROWN.

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# *REVIEW.*

## PAGES D'HISTOIRE, 1914—1917.

(Librairie Militaire Berger-Levrault, Paris: 5, Rue des Beaux-Arts).

The 132nd, 133rd and 134th numbers of this series will be dealt with in our next number.

### *HISTORY OF THE RUSSIAN REVOLUTION.*

The 135th number is entitled *Histoire de la Révolution Russe* (1905—1917) and deals with a subject which is engrossing public attention to such an extent as to justify precedence being given to its issue from the Press.

The contents of the volume are arranged in 39 short sections and it is stated by the editors that French, Swiss, English and American newspapers and periodicals, and more particularly *Darkest Russia*, 1912—1914, have been drawn upon for the materials for the story told in the volume.

I. The story begins with the accession, on the 1st November, 1894, of Nicholas II. to the throne of All the Russias. On his advent to power, it had been hoped that a liberal and progressive *régime* would succeed the brutal reactionary rule for which his father was responsible during the thirteen years preceding the date mentioned above; but the trend of events soon brought disillusionment to the Russian people. Nicholas was well intentioned and had the welfare of Russia at heart, but he wished his subjects to be beholden to him alone for any amelioration in their lot that might be vouchsafed them.

The Czar's intentions were announced, without any circumvention, on the 30th January, 1895, when he addressed a deputation from the *zemstvos* which had waited upon him to offer their dutiful and humble congratulations on the occasion of His Imperial Majesty's marriage, in the previous November, to Princess Alice of Hesse; an autocratic *régime*, he announced, was to be continued as in the preceding reign. The *zemstvos* saw their hopes regarding the introduction of a Constitutional form of government relegated to the limbo of idle dreams.

Russians were grateful to their ruler for all he did to maintain the Franco-Russian Alliance and also for the steps taken by him which resulted in the assembly of the first International Peace Conference at The Hague in 1899, but Russian Liberals were profoundly disturbed by the unfortunate policy initiated by him in the summer of 1898 in Asia, which led to the rupture with Japan; by the violent measures adopted for the Russification of Finland, the Baltic Provinces and Poland (1899—1903); by the massacres of Jews, in 1903, at Kishinev and at

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Homel; and finally, by the cruel treatment meted out to the peasants, which led to the outbreaks of 1902—1903.

II. The diplomatic tension which had long existed between Russia and Japan led, on the 6th February, 1904, to the declaration of War by the latter. The Treaty of Portsmouth (5th September, 1905) brought this conflict, so ruinous to Russian prestige and interests in China, to an end. Although, under all the circumstances, the humiliation suffered by Russia cannot be considered to have been excessive, yet the defeat suffered by the Russian arms was keenly felt throughout the Empire and gave rise to violent excesses, which led to pitiless repressive measures being taken by the government for the purpose of restoring order.

A widespread desire prevailed in Russia to apply some measure of popular control over the bureaucracy, to whom the disasters being experienced by the Empire were rightly attributed. The idea was not a novel one, even in Russia; on many occasions in the XVII. Century Assemblies had been called together to deal with national questions of importance. However Nicholas II. and his advisers were obdurate, in spite of the general unrest and the assassination, in 1904, of Bobrinov, the Governor of Finland, and of Plehve, Minister for the Interior, events which ought to have convinced them that concessions acceptable to the people were urgently needed.

III. Plehve was succeeded by Prince Sviatopolk Mirsky, a man possessing a benevolent disposition and liberal ideas. In November, 1904, the police permitted a private meeting of delegates from the *zemstvos* and municipalities to be held in Petrograd. At this meeting a resolution was passed calling on the Czar to create an elective Parliament, to grant equality of citizenship to all his subjects alike and to guarantee their personal liberty. Mirsky was favourably disposed to the proposals contained in the resolution in question; but, acting under the influence of the Grand Duke Serge and others, particularly of Pobedonostzev, the fanatical Procurator of the Holy Synod, the Czar met these demands by the issue of an ukase (25th December, 1904) announcing a few relatively unimportant reforms only in order to satisfy the labour group and the peasantry, and, at the same time, carefully avoided all reference to Constitutional Reform. The Czar's act increased the exasperation of the masses; the *zemstvos* of Moscow and of Tchenigov adjourned *sine die* and, in doing so, announced that the ukase of the 25th December did not meet the requirements of the situation. On the 2nd January, 1905, Russia learnt with consternation the news of the fall of Port Arthur. Prince Troubetskoï, President of the *zemstvos* of Moscow, now addressed an open letter to the Minister for the Interior, informing him that Russia was on the brink of a revolution and that the grant of complete liberty to the people would alone save the country from the impending disaster. Mirsky, who was not prepared to go to extremes in opposing the popular demands, resigned office and was replaced by Bouliguine, a man who was unknown to the public.

A strike on a great scale, 100,000 workpeople being involved, was organized by the Central Council of the combined Trade Unions; the

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workers downed tools in Petrograd on the 16th January, 1905. On the 21st *idem*, a group of strikers, led by the notorious Gapone, demanded that the Czar should receive a deputation at the White Palace, but Nicholas II. decided to remain at Tsarskoe-Selo. On the following day whilst a body of unarmed strikers were peacefully marching to the Winter Palace, they were fired upon by troops and charged by Cossacks; these operations claimed more than 4,000 victims and so exasperated the masses that it led them to commit great acts of violence and rioting continued for several days. On the 24th *idem*, a body of 20,000 strikers marched on Tsarskoe-Selo with a petition to the Czar; but the road was barred to them by infantry and artillery. The troops came into action, killing and wounding large numbers of the people. General Trepoff was now appointed Governor of Petrograd, with full powers to crush out the insurrection; he did this work with thoroughness, blood flowing freely in the streets of the Russian capital. The insurrection spread to Moscow, Warsaw and Sosnovice. The Grand Duke Serge, one of the pillars of the reactionary *régime*, was assassinated in the streets of Moscow on the 17th February, 1905, and, on the same day, 30,000 men again came out on strike in Petrograd. The situation became extremely serious in the following month; workpeople and the peasantry made common cause in setting fire to factories and country mansions. The trouble started in south and mid-Russia and soon spread to Livonia, the Baltic Provinces and the Caucasus.

IV. At last Nicholas II. appeared to be struck with fear; replying on the 19th June, 1905, to a deputation from the second Congress of the *zemstvos*, he promised to convoke a national Parliament. However, a deception was again practised upon the people. The Law of 19th August, 1905, which brought the "Duma" into existence, gave this body only consultative functions; its duty was merely to examine legislative proposals prepared for submission to the Council of the Empire and to report upon them; the Czar alone could give such proposals statutory effect. Moreover, the members of the Duma were at the complete mercy of the Government; the Senate could at all times deprive them of their seats. This shadow of a Constitution satisfied no one. Grave disorders occurred in Poland; a mutiny took place on the Black Sea on the warship *Kniaz-Potemkin*, the officers being killed by the crew; the arrival of this vessel at Odessa was later the occasion of a collision between the masses and troops; arson, pillage and murder were rife (6,000 victims). Sailors mutinied at Libau, but on the whole the Army and Navy remained loyal to their Ruler.

V. In October, 1905, the situation again became exceedingly critical; a general strike led to the stoppage of railway traffic and the mail service and completely paralyzed national life. The Government was obliged to make concessions; Witte ranged himself against Pobedonostzev and persuaded the Czar to promise Russia a Constitution, a ukase being published on the 30th October, in which it was announced that a National Assembly would be set up, liberty of conscience conceded and personal liberty guaranteed.

The bureaucracy realized that its power was menaced and astutely succeeded in inducing the Crown to enrol an anti-revolutionary Militia,

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under the style and title of the "Union of the Russian People," later known as the *Black Hundred*. These mercenaries inaugurated a reign of terror, particularly in Odessa (1st to 4th November); the populace retaliated with a counter-move. It was hoped that the troops would side with the people, but disaffection had not penetrated very deeply into the Czar's Army at this date; three soldiers alone did so and their regiment conducted itself, apparently for this reason, with more than usual brutality against the insurgents. At Moscow alone there were 15,000 victims.

VI. During the autumn of 1905, the year of the "Abortive Revolution," many meetings of *zemstvos* were held with a view to the creation of political parties and the selection of candidates to represent them in the Duma. In addition to the Extreme Right and the Revolutionary (*i.e.*, Socialist and Labour) parties, there came into existence the Constitutional Democratic Party (known as *Cadets*, from the initial letters K.D., of the party name) and the Octobrists. The Cadets demanded the creation of a Constituent Assembly, whilst the Octobrists were willing to accept the extension of the suffrage, and a bi-cameral legislature, viz.:—the Duma and Council of the Empire; the latter became the Upper Chamber, half its members obtained their seats by election (Law of 20th February, 1906). The Czar attended in person to open the first meeting of this Duma (10th May, 1906). The Liberal parties had won 300 out of the 360 seats, and in reply to the address from the Throne put forward demands which brought them into collision with Goremykine, the Minister for the Interior, who peremptorily rejected their programme which included, *inter alia*, universal suffrage, a Parliamentary *régime* similar to that of Great Britain and France, expropriation of private lands, etc., etc. The Duma retorted by passing a vote declaring their want of confidence in the Minister for the Interior (26th May, 1905). But ministerial responsibility had not been provided for in the Constitution and, a few weeks later (1st July), the Assembly was dissolved: Stolypine now succeeded Goremykine. The Cadets, recalling the meeting of the Tiers État at Versailles in June, 1789, and the oath then sworn at the *Jeu de Paume*, to secure a Constitution for France, met at Viborg, Finland, and published a Manifesto (to which there were 181 signatories), in which, it was stated, that the Russian Constitution had been violated; they called upon the people to refuse to pay taxes and to decline to perform military service. The Government retaliated by meting out severe punishment to the signatories of the Manifesto and instituted travelling Courts Martial to deal with those who might be intending to promote a rebellion. Russia now passed under the heel of the secret police; the people were deprived of their most elementary rights, the Press was tightly held in a leash and all the concessions of 1905 were abrogated.

The first Duma, the so-called "Duma of the National Anger," had attracted to its membership the *élite* of Russian intellectual society; it lived for but 72 days. Within a year two of its members had been assassinated by the *Black Hundred*, three had been deported under ministerial decrees, eight had been removed from their districts, six had been banished into exile, one had disappeared.

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VII. Stolypine now made preparations for new elections; he interpreted the Electoral Law to suit his own views and exercised shameless pressure. In spite of this the second Duma, which met on the 19th March, 1907, was no more favourably disposed to Autocracy than its predecessor. The Right and Octobrists composed one-fifth of the Assembly only. The Cadets remained masters of the situation, although their numbers had been reduced; to them then fell the choice of a President. Stolypine attempted to temporize and submitted a programme of reforms to the Assembly on the 1st April, 1907, providing, *inter alia*, for the emancipation of the peasantry and the assignment for their benefit of the Crown Lands. The majority, however, desired the adoption of effective measures and were not to be put off by promises. It demanded the suppression of the Courts-Martial and the expropriation by the State of the large private estates. The Government now resorted to a mean trick; *agents provocateurs*, disguised as soldiers, pretended to hatch a plot and endeavoured deceptively to induce the deputies to countenance their action. They met with little success in their intrigues, nevertheless, Stolypine suddenly entered the Duma (24th June, 1907) and demanded that 16 of its members should be handed over into his custody and 55 others put under arrest. The Duma referred the matter to a Committee for investigation; this provided the necessary pretext for its dissolution, which took place two days later; a ukase was at the same time issued fixing the 16th September as the date for the new elections.

VIII. These elections did not take place in accordance with the rules promulgated in the Imperial decree of 1905; a good deal of jerrymandering took place, in which Kryjanovsky, the mischievous Secretary of State, played an active part. These elections resulted in giving the Right a majority in the third Duma; Khomiakov, an Octobrist, was elected President, and Prince Volkonsky, a member of the *Black Hundred* League, became Vice-President.

The Third Duma had a life of five years (November, 1907, to November, 1912); it devoted its attention to matters of minor importance which were in no way essential to the interests of the masses; *inter alia*, it created a class of peasant proprietors. This reform was initiated by Stolypine, who astutely desired to create a conservative element among the peasants that might act in opposition to the Socialistic tendencies of the *Mir*. Peasant proprietorship proved, however, a failure in Russia.

IX. Relieved for an instant from anxiety and all control, the hearts of the reactionaries leapt with joy. The Manifesto of October, 1905, the Right declared, had changed nothing; as the Autocracy was free to make concessions, so was it free to withdraw them. Much occurred during this period which was a source of considerable irritation to the Russian people. Fines and suspensions rained on the Press; Poland was crushed; Finland systematically molested, etc., etc. The only events favourable to Russia which occurred during the life of the Third Duma was the Entente between the great Slav Empire and Great Britain, formally sealed by the visit of Edward VII. to Reval (9th June, 1908).

X. The following notes deal with the political institution of Russia as they existed in 1912. The Constitutional changes resulting from the ukase

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of October, 1915, were more apparent than real; Russia had been endowed with an elected Council and, it may be, that had this Council of the Nation not been in existence the Revolution of 1917 might not have grown beyond the dimensions of an *émeute*.

The creation of the Duma of the Empire did not kill autocracy and arbitrary rule. True, the Duma had the privilege of voting laws, but these remained a dead letter, until and so long as the Council of the Empire and the Czar decided to accept them. The deputies had not even liberty of speech in the Assembly. The Czar could at will prorogue or dissolve the Duma, and, in its absence, could continue to rule by promulgating ordinances, having the full force of law. Ministers were not responsible to the Duma; if interpellated they could refuse to reply thereto. The Duma only voted a part of the Budget; vast sums required for the public service escaped its control. Finally, the Government was in a position to suspend all the fundamental laws, merely by proclaiming a *state of siege*; this power was being continually exercised.

The body called the Senate in Russia is really an Appellate Court, a Supreme Court of Justice, and does not exercise the functions usually attributed to a Senate; it was created by Peter the Great. The real Upper Chamber (since 1906) is the Council of the Empire, originally created by Alexander I.; half its members are elected by various bodies and the remainder are the nominees of the Czar. The national crisis of 1916 brought the Council of the Empire into agreement with the Duma on essential matters; previously, it had as a rule been in opposition to it.

The Holy Synod, created in 1721, is charged with the Government of the Russian Orthodox Church. The reforms of 1864 abolished, in theory, the secret procedure in vogue up till then and separated the judicial from the administrative powers of this body, but in matters affecting marriage and divorce the ecclesiastical tribunals, under its jurisdiction, continued to sit in secret. The Russian Church has at no time risen to the height of its mission. Under its guidance a superficial Christianity of pompous ceremonies and ikons has prevailed throughout the land; it has been a church accommodating itself to licentious incredulity, sectionalism and the most degrading kinds of superstition. The Procurators, who represented the Czar, and, in consequence, presided at the Council of the Metropolitans and Bishops, have nearly all inclined to the side of the reactionaries.

XI. The vast edifice of the Empire rested on a hierarchic bureaucratic administration, organized on the lines of an army, having 14 grades called *tchines*. This administration has come in for more abuse than it has deserved; on the whole, it has been fairly efficient. It must be remembered that all bureaucracies tend to become arbitrary and corrupt when insufficiently controlled. The recruiting of this Russian bureaucracy was conducted on wrong lines, and hence desirable candidates avoided a career where vices have been held in higher esteem than virtues. The Russian Civil Administration was entirely of Germanic origin and was permeated with Germanic influences. An important part of it was the police, the political section of which, the *okhrana*, fully merits the severe condemnatory remarks passed

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upon its methods, etc.; it was the former Third Section of the Imperial Chancellery of Nicholas I. (1826), which was reorganized by Alexander (1880). The methods of the police were summary and veiled in secrecy; spies and the *agent provocateur* were its principal tools. The *okhrana* was an *imperium in imperio;* in March, 1914, Vladimir Bourtzev enumerated 33 acts of terrorism charged against a single one of its agents, the notorious Azev. Many of the offences attributed to Nihilists were really the work of the police. The *régime* of the *okhrana* weighed heavily on the people, so much so indeed that in February, 1913, the *Golos Moskvy* (an Octobrist publication) expressed the opinion that: "The day on which Russia succeeds in shaking off the chains of the *okhrana* will be that of a second emancipation from serfdom."

XII. Oppressed Russia has been, however, permitted to enter upon its apprenticeship of political education and has experienced some alleviation of its miseries by reason of the activity shown by the *zemstvos* (Provincial Assemblies) since 1864, and by the *gorod* (City Corporations and Municipal Councils) since 1870, in connection with the practical problems of Local Government; politics were placed outside their sphere of influence by a law of 1864, but matters affecting the economic welfare of the people, hygiene, philanthropic endeavour and education were handed over to them.

In 1867, the Government attempted to paralyze the *zemstvos* in matters connected with schools and public libraries; and in 1874, their initiative in relation to public instruction was definitely killed. The more active members of the *zemstvos*, in consequence, formed a secret league, the *Zemski-Sobor*, with the object of securing reforms. In 1878, the *zemstvos* started a campaign of petitions, and appeared at one time to have won over Alexander II. to their views, but when the time for action arrived he refused his sanction to the measures proposed. In 1882, the control of education was taken entirely out of the hands of the *zemstvos*, and their functions were otherwise interfered with.

The famine of 1891 and the cholera epidemic of 1892 resulted in the restoration of some of their former powers to the *zemstvos*. During the Japanese War, a union of the *zemstvos* and the *gorod*, known as the *zemgor*, undertook many duties at the front and on the lines of communication, which were highly appreciated by General Kouropatkin; under Prince Lvoff, the future President of the Provisional Government of 1917, this body did much to make up for the defects in the supply services and in the hospital organization.

Lvoff has, during the present War, proved himself to possess high administrative capacity and has been the moving spirit in many departments connected with the prosecution of the War.

XIII. The gravest defect of an autocracy is that the power of its head is a sham; for in reality a large share of the power is in the hands of a number of irresponsibles, who exploit it for their own profit. As in other monarchies, so in Russia, the effective power has been in the hands of favourites or favoured ones; under Nicholas II. charlatans acquired a mysterious power which they pretended to use in furtherance of the interests of the dynasty.

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The Czarina, who only gave birth to a male heir to the house of Romanoff in the tenth year after her marriage, appears to have been much concerned at one time at the prospect of a failure in the male line of the reigning dynasty in Russia and seems to have fallen under unfortunate influences in seeking the fulfilment of her yearning desire. She even went the length of approaching the President of the French Republic to secure the title of Doctor of Medicine for one Philippe, a Lyonnais hairdresser. This quack, having predicted that the Czarina was pregnant, when such was not the case, was disgraced, but his place was soon taken by others of his ilk.

The Cesarevitch has always been delicate and a story has been in circulation that an accident (or some mysterious circumstance) might lead to his being the last of his line. In the event of his death at an early age, the Czar's brother, the Archduke Michael, would succeed to the throne; the Czarina is said to have a great antipathy towards this brother-in-law. She seems to have been carried away by her maternal devotion and by her immense pride; her great ambition was that her son should succeed to unbroken autocratic power. Some affirm, whilst others deny, that she is German at heart. Her sentiments may become fully known when the materials for the full history of our time becomes available.

XIV. Two intriguing bishops, Hermogene and Theophane, introdueed a monk named Iliodor into the Court; he has been responsible, since 1907, for the *Pogroms* (*i.e.*, the pillage and massacre of Jews). Iliodor acquired great power and passed for a saint; he in his turn took under his protection one Grigori Novykh, a Siberian peasant, who adopted the name Rasputin, *i.e.*,the Dissolute, as an act of self-reproach for the follies of his youth. Those who supported Rasputin most strongly were, it is alleged, persons at Court hostile to Iliodor and Hermogene. It was Madame Wyrouboff, maid of honour to the Czarina, who seems to have made Rasputin's fortune. Rasputin was a first-class rogue and claimed that he had been invested by Divine Providence with the power to perform even miracles. Rasputin's influence at Court became exceedingly great; he persuaded the Holy Synod to dismiss Hermogene; Iliodor was chased out of the Church and imprisoned, owing to the Siberian, but later managed to escape to the United States of America, where he remains. Rasputin's power at Court gave rise to scandals, so much so indeed that in 1912 the newspapers were forbidden to mention his name. The *Golos Moskvy* disobeyed this injunction, and suffered the confiscation of its offending sheets. An echo of these scandals was heard in the Duma: "The sanctity of the altar and that of the throne are," cried out the Deputy Goutchoff, "in danger; there exists at the heart of the people a festering ulcer." Rasputin was obliged to withdraw himself from the Royal palace, but in doing so, hurled menaces and announced that his presence was essential to the well-being of the Imperial Family. The Cesarevitch now fell ill; the Duma having meanwhile been prorogued, Rasputin was recalled, and the heir to the throne quickly recovered. In April, 1914, this adventurer was violently attacked by Bishop André of Oufa, but the fashionable world continued to pay him court and strange stories were afloat concerning

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his *amours*. The Holy Synod of Russia did not treat Rasputin with the same firmness that the Roman Church has exhibited under similar circumstances; the latter Church has broken many men of his stamp, but the former, knowing all, was purposely blind.

Rumour may have credited Rasputin with more misdeeds than he was really guilty of; one thing is certain that with all his coarseness, he exercised a strange and dangerous fascination over the weaker sex, in the highest as well as in the lowest social class.

XV. The Extreme Right expected to secure a majority in the Fourth Duma; the pressure exerted by Makharoff, the Minister of the Interior, passed all bounds, and should have resulted in an enormous majority for this party. The turn of events, however, brought about an unexpected situation; many reactionary deputies, elected owing to Government support, transferred their allegiance to the opposition. It was in the ranks of the Cadets that the energetic, forceful and upright politicians were once more to be found: the chief amongst them was Milioukoff, formerly a professor at the Universities of Moscow and of Chicago. Among the new members was Kerensky, Deputy for Saratov, then aged 30. An ardent believer in the cause of liberty and justice he had been impelled by unseen forces into the ranks of the Extreme Left By Kerensky s side stood another man with a future, Tchkheidze, a Caucasian deputy, who was the sole survivor amongst the social democrats of the Third Duma.

XVI. The Fourth Duma, from the time its first session came to an end (28th December, 1912), began to appeal to the Government to give effect to the spirit of the Imperial ukase of October, 1905, in the matter of Constitutional reforms. The municipal elections in Petrograd, which had taken place at this time, ended in a defeat for the Right and put the opposition in the majority.

On the 6th March, 1913, the Duma gave a favourable reception to a new Manifesto from the Czar, issued to commemorate the tercentenary of the birth of the Romanoff dynasty, in spite of the fact that no promises similar to those of 1905 were contained therein. A few weeks later, however, a resolution was passed, by 146 votes to 113, calling attention to the oppressive measures still being taken by the Government, although order had been completely restored. The Ministers of Justice and Public Instruction gave on this occasion a catalogue of the illegal acts, etc., alleged to have been committed by the Imperial Government. In consequence of the incessant provocations fresh strikes broke out and nearly a million workmen downed tools, 100,000 of them in Petrograd alone (19th November, 1913). Representatives of the Municipalities had gathered at Kieff (in October), to pass resolutions of a character extremely hostile to the Government, but the police intervened and broke up the meeting. The Octobrists were now becoming more and more independent and openly ranged themselves against the Council of the Empire and decided to fight the Government with every legal weapon within their grasp.

The Russification of Finland continued with unabated vigour and raised reiterated protests on the part of the Liberals.

XVII. In 1910, Sazonoff, a liberal-minded and honest statesman,

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took over the Ministry of Foreign Affairs and succeeded, in spite of Slavophil agitations, in maintaining, during the Second Balkan War, the principle of joint action on the part of the Great Powers. In order to secure peace, he agreed to the cession of Scutari to the Albanians, as demanded by Austria, and soundly rated the King of Montenegro for his obstinacy, which had nearly set Europe in flames. Kokovtseff, the Russian Premier, also showed a pacific attitude and was equally anxious to see the Balkan difficulties removed, owing to the concert of the Powers, by agreement between Austria-Hungary and Russia. Liberal Russia was as pacific as its Government; but the internal situation of the country was becoming acute. The Czar had, in connection with the jubilee of the creation of the *zemstvos* (January, 1914), been pleased to recognize their services to the Empire, but said no word that could be construed as indicating that the powers of the bureaucracy and the police would be in any way curbed. The menacing words then, particularly addressed to the Octobrists, which were spoken by Milioukoff at the banquet given in Petrograd to wind up the jubilee fêtes fell as a bombshell.

XVIII. The Government continued its policy of pin-pricks. It refused to allow the centenary of Taras Shevtchenko, the national poet of the Ukraine, to be celebrated and thus caused a protest to be raised in the Duma. It condemned Professor Baudouin of Courtenay to be imprisoned for two years for having published, in 1912, a pamphlet in favour of Federal Government. He was, however, provisionally set at liberty. His release caused enthusiastic demonstrations of sympathy and he became the recipient of congratulations from practically all parts of Russia. In March, 1914, further serious strikes broke out in Petrograd and the Government again resorted to measures of extreme severity in repressing them. They even went the length of prosecuting the Deputy Tchkheidze for a speech made by him in the Duma. A few weeks later the Duma was warned that the Government intended to carry out a *coup d'état* against it with the aid of its favourite auxiliaries, the *Black Hundred*. Many questions affecting the public interest came before the Duma at this time; Rasputin was once more denounced in the Assembly; the Beïlis case gave rise to violent scenes and led to the resignation of the Vice-President of the Duma; Kasso, the Minister of Public Instruction, who had been allowed to remain in office, in spite of his scandalous conduct, was violently attacked; Soukhomlinoff, the venial Minister of War, was equally badly handled. An attempt was made to meet the situation by proroguing the Duma (27th June), and its sittings were not resumed till 28th October. In the meantime strikes began to multiply in an alarming manner. At Moscow and in the Caucasus the repeated strikes gave birth to the idea that an attempt should be made to effect a mobilization of the proletariat for the purpose of fighting the Government.

XIX. With Germany's sudden declaration of War (1st August, 1914) the danger of Civil War at once vanished. Poles, Finns, Little Russians, Caucasians became united in a common cause, the defence of their homes. Abroad, Russian exiles, at enmity with one another, became reconciled; thus the anarchist Kropotkine held out the hand of friendship to his old

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opponent Plekhanoff, the leader of the Social Democrats. All the strikers, with one accord, picked up tools and restarted work.

XX. All honour, be it said, is due to the Czar in spite of his faults, for having taken the initiative in calling together the first Hague Conference. He it was also that, with a stroke of the pen, suppressed the drink traffic in Russia. The abolition of the vodka monopoly was the supreme benefit conferred on the Slav Empire by the old *régime*.

XXI. Anatole Leroy-Beaulieu, who knows Russia intimately, has many a time sounded the warning note that Russia was ill-prepared for waging an offensive war and, moreover, that the sympathies of the ruling class were decidedly pro-German. The pro-German sympathies arose not only by reason of the alliance of the House of Romanoff with the House of Hesse by marriage, but also by reason of the profound repugnance of Russian officialdom to the democratic institutions of the Entente Powers. The *Zemstchina*, a favourite journal of the reactionaries, and one which was strongly supported by the War Minister, continued to advocate a *rapprochement* with Germany and held up to opprobrium Great Britain and France, countries alleged " to be governed by Freemasons and Jews." The fashionable salons of Petrograd were the hotbed of Germanic influence and propaganda; the Slavophil movement, of which Moscow was the centre, and the democratic movement, which was up against Prussianism, were able to make but little headway in opposition to Germanic interests in the highest social and bureaucratic circles.

The Tannenberg disaster (August, 1914) and the retreats from Galicia and Poland (May—September, 1915) were wanted in order to bring home to the Russian people the fact that not only were they being ill served and robbed, but also betrayed. The affair of Lodz, where Rennenkampf showed almost criminal negligence, undoubtedly moved public opinion in Russia profoundly.

When the Russian Armies had to retreat from the Dunajec, owing to a failure to supply it with arms and ammunition, when Poland and the fortresses of the Niemen fell into enemy hands, it was not the Grand Duke Nicholas who was blamed; indeed, it was recognized that he also had been betrayed, as was the case with Russia herself. But it was Soukhomlinoff, who had not ceased to declare that Russia was amply provided with military equipment, etc., who had to give place to Polivanoff; at the same time, Colonel Miassoyedoff was arrested and executed

XXII. Soukhomlinoff and Miassoyedoff had married bosom friends. The former's wife had extremely close relations with one Altschiller, an Austrian contractor, having business relations in Germany. Soukhomlinoff had been denounced in the Duma in 1913, in relation to certain scandalous transactions. Later, it transpired that he had personally acquired considerable riches. There seems little doubt that his Ministry had become a nest of spies, against whom no effectual action could be taken owing to the protection afforded them by him. Miassoyedoff was formerly a member of the *okhrana*. He had long been stationed, in a confidential post, at Wirballen, on the Prussian frontier; he had, during his stay there, established intimate relations with the

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Prussian nobility in the neighbourhood. When the War broke out he was attached to the Grand Duke Nicholas's Staff The Russians learnt that all their plans were being communicated to the Germans by him; this was ascertained from a letter found on a German officer taken prisoner by the French. Missoyedoff had been suspected of treachery since 1912.

Although Russia had great factories, which could have been organized for the production of munitions, no steps were taken to this end until Polivanoff succeeded to power. The *zemstvos* intervened actively in this matter, acting independently of the bureaucracy. The work at the Russian factories was speeded up by degrees and eventually their output was increased tenfold. Russia had been receiving immense quantities of munitions from Great Britain, the United States of America and Japan but the leakage was so great as to swallow up a very great part of these consignments.

XXIII. The national anger was growing, but the Government's only reply was a further resort to the policy of *pogroms*; *i.e.*, an attempt was made to divert attention from the delinquencies of the bureaucracy by letting assassins loose on to the millions of unfortunate Jews who inhabit Russia and Poland. Rivers of blood were made to flow in the Jewish quarters of the towns. On the 5th July, 1915, the whole of the Jewish Press was suppressed. The persecutions of 1881 and 1905 shade into insignificance by the side of the massacres which now took place.

These infamous acts did not succeed in diverting public opinion. An influential committee was now formed, under the Chairmanship of Count Ivan Tolstoi, Mayor of Petrograd, and a petition was promoted by it claiming civil and political equality for the Jews. Protests were also raised in the Duma against the excesses committed against the Jews. "The offenders are not," said Tchkheidze, "the Jews; they are those who have enriched themselves at the expense of the Army, they are those who have sold Russia, led by the Miassoyedoffs. And if it is really desired to find the offenders, it becomes necessary to throw a searchlight on the *rôle* played by Maklakoff, the Minister of the Interior."

XXIV. The new session of the Duma was opened on the 1st August, 1915; Goremykine made a conciliatory speech. The Imperial promises made in respect of Poland were re-affirmed. The Government recognized that the Administration was being overwhelmed by the exigencies due to the War and put forward a proposal for the formation of a Munitions Department to be run by representatives from the *zemstvos*. A Committee was accordingly formed under the presidency of Goutchkoff, who became Minister of War later (March, 1917).

On the 3rd August, after the re-election of Rodzianko as President, the Duma passed a resolution declaring the determination of the nation to see the War through to a finish. The opposition demanded that disciplinary action should be taken against those responsible for the deficiencies in munitions that had come to light; a Commission was appointed to investigate the matter. The meeting of the 14th August was particularly stormy, many of the grievances of the nation being passed in review. But the Government staved off defeat.

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At the end of August some members of the Duma and of the Council of the Empire met with a view to the selection of a man of energy and vigour to succeed the somnolent Goremykine as Premier. A demand was made by the Municipal Congress of Moscow for the replacement of the obscure bureaucrats in charge of the nation's affairs by men well known to the people. Once more the nation raised its voice against the apathy and incapacity of those in charge of the Administration.

XXV. At the beginning of September, 1915, it appeared for an instant that the Czar and his subjects were at last of one mind. After taking over Chief Command of the Russian Armies in the field, Nicholas II. pronounced words which carried comfort to the nation. All the institutions in Russia had responded splendidly to the call of patriotism; the Czar reiterated the nation's desire to fight to a finish, and Rodzianko replied that Russia had ranged up round her sovereign and was prepared to make every sacrifice in order to release herself for ever from the chains which Germany had forged wherewith to bind her. However, the Russian disaffection proved too deep rooted to be removed by the flow merely of fair words. A new rupture now took place owing to the attitude of the Left in the Duma, which expressed a wish to see ministerial responsibility to this Assembly established. Nicholas II., being irritated or circumvented, prorogued the Duma, on the 16th September, to the 14th November. More strikes and *émeutes* now took place and the newly-appointed Minister of the Interior, Stcherbatoff, had to retire in favour of Khvostoff, a former Governor of Kieff; the latter's first act was to proclaim martial law in Moscow. The elections to the Council of the Empire which now took place resulted in important gains to the progressives. In November, there was further trouble in the Duma. In addition, the Germanophil tendencies of the Extreme Right began now openly to display themselves.

XXVI. Peace rumours were being insistently circulated in Russia in January, 1916, although, at the review of the Knights of St. George held on the second of that month, the Czar had expressly stated that he would be no party to a peace until the last German soldier had been chased from Russian soil. It was even said that Germany had specifically put peace proposals before Russia and Japan. In reply to questions on the subject, the Russian Foreign Minister gave the ambiguous answer that a great number of peace offers had been received, but no notice had been taken of them. There existed a strong suspicion that there were persons in Russian high circles who were disposed to betray the Entente, and, indeed, it was openly so stated in the Duma in July, 1916.

On the 3rd February, 1916, Stürmer, a *protégé* of Rasputin, succeeded Goremykine, as President of the Council of Ministers. The Duma reassembled on the 16th *idem*, the Czar attending the ceremony. Stürmer and Polivanoff made patriotic speeches; the former promised municipal reforms, the latter spoke in laudation of the reorganization of the Army. Sazonoff also spoke, declaring with vehemence that the Entente must put an end to the voracious appetite of Pan-Germanism; that the whole of Russia wished to see an autonomous and reconstituted Poland. During this debate, Tchkheidze too made a speech; this was

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at first kept out of the papers by the censor. He accused all the Great Belligerent Powers of egotism and stated, on behalf of himself and his Socialist friends, that they wished for a peace without annexations and indemnities, and that this was also the wish of the German and Austrian Socialists.

XXVII. The position of the Liberals now became very strong in the Duma; the moderate Nationals, the Centre, the Octobrists, the Progressionists and the Cadets formed a "progressive *bloc*." This *bloc* was determined to carry out the policy of prosecuting the War to a finish; the Extreme Right and the Extreme Left alone opposed this policy.

At the beginning of March, 1916, the Cadets held a meeting and published a Manifesto declaring that Europe and Russia were not perpared to tolerate Prussian Militarism; that Belgium and Serbia must not disappear; that Poland and Lithuania could not remain in the grip of Germany; that Armenia must not be handed over to German executioners. The task of winning victory, it was said, was inseparable from that of affecting internal reforms; in order to conquer it was necessary to reorganize the nation.

The disclosure of a scandal connected with the use of the funds of the Ministry of the Interior led to the retirement of Khvostoff who was succeeded by Stürmer (19th March).

Protopopoff, having visited Paris in May, returned to Russia *viâ* Stockholm; and it is alleged that during his stay in the latter city he paid several visits to a Hamburg banker with whom he had been put in touch by the German Ambassador in Sweden. Offers of a separate peace are said to have been discussed at these visits, and it is further suggested that funds were placed at Protopopoff's disposal for starting a newspaper.

On the 23rd May, changes of considerable importance in the Government were suddenly announced and caused a good deal of astonishment. Sazonoff was succeeded as Foreign Minister by Stürmer; Khvostoff went back to the Ministry of the Interior; Makharoff took over the Ministry of Justice.

Public opinion, being ill-informed concerning the secret forces in play and of the "Rasputin policy," attributed the downfall of Sazonoff to the Polish situation, which, at that time, was occupying the Entente Diplomacy. The fact is that Stürmer, with the support of the Czarina, had caused imputations to be cast on Sazonoff's loyalty in relation to proposed reforms in Poland. Stürmer did not commit himself with regard to Poland; he temporized, hoping thus to give satisfaction to the Extreme Right and to the Court Party.

Towards the end of July, 1916, the Russians completed, by the capture of Erzindjan, the conquest of Armenia and, at the same time, Broussiloff's offensive in Bukovina and in Galicia was eminently successful. However, just when expectation with regard to the capture of Lemberg had reached its culminating point, the spirit of the Russian troops appeared suddenly to droop; it began to be rumoured that the ammunition supply had failed and this probably was true. The manufacture of ammunition in Russia and its importation into the country had been continued unceasingly, but for some mysterious reason it was not reaching the Russian Armies in the field.

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XXVIII. Under all the circumstances, the advice given by Broussiloff to Roumania not to enter into the War was decidedly sound; but he was almost the only person who took this course. The Russian Government and Press insisted upon Roumania's participation in the War as a belligerent. The Roumanians were told that if they struck at Transylvania and Hungary, Russia would co-operate by an offensive move on Dobrudsha. Roumania declared War on Austria on the 27th August, 1916, and at once invaded Transylvania, leaving but few troops on the Dobrudsha. The assistance Russia provided proved insufficient and, in consequence, the Dobrudsha was overrun by Germano-Bulgarian forces. The Germans were also successful at Craiova and seriously threatened Bukharest. It was believed that a large Russian Army was marching at this time from Bessarabia and Moldavia on to the Argesu, and the German Armies appeared to be in a perilous position; the strategy of the German Great General Staff had been considered recklessly bold by the ill-informed. No Russian Army put in an appearance to relieve the pressure on Bukharest. Roumania called in vain for guns and munitions; the guns and munitions sent by Great Britain and France for the Roumanian Army were held up on the Russian railways. Bukharest fell on the 6th December, 1916, and the troops of Central European Alliance occupied Wallachia and the Dobrudsha. The Russian Army in Moldavia now covered the retreat of the main Roumanian Army and gained time for it to be reformed behind the line of the Danube.

Public opinion was as much disturbed in Russia by these untoward events as was public opinion in the countries of her Allies. In consequence, when Protopopoff succeeded Khvostoff, as Minister of the Interior, voice was given to the resentment against him. The situation became so critical that the Imperial family had to intervene. The widow of Alexander III. had rarely seen her son in recent times. She had completely fallen out with her daughter-in-law over Rasputin and his *clique*. In October, 1916, she however met Nicholas II. and had a long interview with him. In well-informed circles, it is stated, that Sir G. Buchanan, the British Ambassador at Petrograd, had urged the Czar to appoint a responsible Cabinet and to get rid of Rasputin. The Czar refused to do so. The Czarina was not by any means discouraged; she felt that she had the support of the Grand Dukes. Nicholas Michaelovitch presented the Czar with a document, prepared by members of his family, urgently pressing upon him the necessity of adopting measures similar to those advocated by Sir. G. Buchanan (15th November); Nicholas II. was also entreated to replace Stürmer by Trepoff and to remove from the Court persons of German sympathies, particularly Protopopoff. The Czar appeared to be disposed to listen to reason, but the Czarina, learning of what was in the air, hastened to his side; and having heard Rasputin's name referred to in the document, she seized it and burnt it.

The Duma reassembled on the 14th November, 1916. The President again announced that Russia would never betray her Allies and repudiated with indignation the very idea of a separate peace. The Government again accepted the principle of a Poland

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reconstituted in its entirety. The pro-German tendencies of the Ministers were denounced by Milioukoff, and others, and gave rise to disorderly scenes. Stürmer decided to arrest Milioukoff, but had to desist in taking this step owing to imposing demonstrations made in his favour in the Duma.

The position of Stürmer became exceedingly difficult, particularly in view of the strong complaints made against him by the British Ambassador at Petrograd; on the 24th November he was appointed Court Chamberlain and Trepoff took his place.

XXIX. Trepoff would have liked to dismiss Protopopoff who, with Stürmer, was mixed up in the Pacifist intrigues in progress at Stockholm since the beginning of 1916, under the auspices of a body styled the "Party of the Greens." It is said that Trepoff offered Rasputin 150,000 roubles (about £15,860) if he would get rid of Protopopoff, but contrary to his usual practice, the Siberian rascal refused the gift.

It is believed that Rasputin had been bought by Germany and Bulgaria in 1915. It was in 1916 that this blasphemer made the following remark: "I am only a simple peasant, but one to whom the Almighty has spoken. The Czar is well aware that the life of his only son depends on my prayers. Great persons have endeavoured to have me removed; I spew on them. The spirit of God is in me. The Czarina accedes to my smallest wish. *I have told the Czar that the War is a crime and that it will be the cause of his downfall.* It is necessary above all things that I should work to bring it to an end."

XXX. On the assembly of the Duma on the 2nd of December, Trepoff made a patriotic speech referring therein to the reconstitution of Poland and the conquest of the Bosphorus Channel as being indispensable to the future of Russia. He further declared that it was the desire of the Government to co-operate with the Municipalities and *zemstvos*. His remarks were interrupted by loud cries of: "We do not believe it." The continued presence of Protopopoff on the Government benches readily explains the cause of the dissatisfaction shown by the Duma. Pouriskevitch, from his place in the Duma, implored the Czar to be no longer blinded, but to see to it that Russia was no longer controlled by men in the pay of Germany.

In the Council of the Empire, Trepoff exhorted all parties to work together in the common cause and to put away their differences. The Council passed a resolution calling on the Government to co-operate with the Liberal institutions of the land and to suppress occult and irresponsible influences (9th December). This resolution of the Great Russian Conservative body was much commented upon, nevertheless Protopopoff and Rasputin, who were directly aimed at, remained where they were, one the strong pillar to the other, all powerful at Court.

On the 12th December, 1916, the Imperial Chancellor at Berlin issued his now famous German peace note; Russia, acting in concert with her Allies, rejected the proposal as being a trap. Pokrovsky, who was appointed Foreign Minister on the 14th *idem*, lost no time in associating himself with the Entente reply, refusing to be drawn into useless negotiations. On the 27th *idem*, the Czar published a Manifesto in which he reiterated the decision of the Entente Powers not to enter into any dis-

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cussion of peace terms; that the invader must be first chased from Russian soil, a free Poland must be constituted, Constantinople must be captured; the task before them was immense and required the co-operation of all the country's forces.

The foregoing declarations were calculated to inspire confidence, as both the Czar and Pokrovsky were credited with being sincere; however, the hidden forces menacing Russia had not yet been got rid of and continued to threaten both the honour and the liberties of the country.

XXXI. In the midst of the disquietude that prevailed at this time there occurred a tragic event that absorbed all attention. Rasputin was shot dead at the house of Prince Youssoupoff (December 30th), his body being thrown into the Neva, where it was found by divers on the 1st January. It is stated that the Czarina claimed the bloodstained shirt of the murdered rogue, in which to wrap her own son, and that the body was interred in the Imperial necropolis at Tsarskoe-Selo; the corpse was exhumed during the first days of the Revolution and burnt. Two inquiries were immediately held in connection with Rasputin's death; an official one by the Minister of Justice; the other, a secret one by Protopopoff and his coterie. Trepoff and Ignatieff learnt from the newspapers that they had been dismissed from their posts. Trepoff's place was taken by Prince Galitzine. Petrograd realized that the true master of the Government was from now Protopopoff; he had learnt, it was said, all Rasputin's dodges. Soon, another *moujik*, Mitia Koliaga, more ignorant than even Rasputin, was brought to Court to take the latter's place and to be the new oracle.

Orders were given to the Governors of Provinces to be very severe, in view of the unrest amongst the masses and the possibility of uprisings. The Council of the Empire, having exhibited liberal tendencies, its numbers were increased by an ukase; the 18 new members appointed to this body nearly all belonged to the Extreme Right. Pokrovsky, having proved troublesome, was sent away on two months' leave. The Duma and the Council of the Empire were adjourned, first to the 25th January and later to the 27th February. It was thus that Protopopoff ushered in his Dictatorship. Meanwhile Count Benckendorf, the Russian Ambassador at the Court of St. James', died in London (20th January) with the words on his lips: "An epidemic of a mysterious kind of mental alienation is afflicting the ruling powers in Petrograd." A number of undesirables now climbed back into power, more worthy men having resigned their appointments or having been sent on leave.

The notorious Stcheglovitoff, the guardian angel of the *Black Hundred*, became President of the Council of the Empire; Stürmer again took his seat in the Foreign Office.

Nicholas II. was living at this time at the Russian G.H.Q. at Mohileff, surrounded by military officers, and to some extent outside the evil influences which reigned supreme at Tsarskoe-Selo and Petrograd; there is nothing to connect him with the designs of the promoters of the "German peace." On the 20th January, he addressed a rescript to Prince Galitzine, in which he laid down a truly national programme, and, on the 25th *idem*, His Majesty appointed a Commission to draw up the Constitution of the Poland of the future.

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It is said that during his visit to Russia, Lord Milner endeavoured, with some persistence, to bring home to the Czar the pro-German intrigues which had spun, as it were, a spider's web round him; but Nicholas II. continued to pursue his blind and fatuous course.

The Duma and the Council of the Empire resumed their sittings on the 27th February, 1917. Meanwhile, at a meeting of Russian nobles held at Moscow, a resolution was unanimously passed calling on the Czar to give effect to the resolutions repeatedly passed by the Duma and the Council of the Empire, demanding the introduction of reforms and the appointment of Ministers possessing the confidence of the people.

In high quarters, and in low, the same views were being urged with insistence and incessantly, but in the highest quarter there was systematic neglect to give heed to the warnings to set the Russian house in order.

XXXII. The month of March, 1917, which was to witness the birth of the new liberties of Russia, came in at a time when dark clouds had made their appearance on the horizon. Although Russia had not exported anything for three years and had in reserve large quantities of wheat, yet her people, in the great centres of population, were on the verge of starvation. This condition of affairs was due either to the incapacity or the dishonesty of the Administration, which had failed to make the best use of the transport facilities in the country; maybe it desired—so it has been supposed—to increase scarcity of food stuffs so as to exasperate the people, in order to justify repressive measures, or even to find a new argument in favour of a capitulation. Moreover, it had been noticed that the German Chancellor, when he had last addressed the Reichstag, had carefully refrained from making any allusion to Russia and to the German schemes of annexation in the East. Abroad, in spite of the strictness of the censorship voice was given to the disquietude which existed in relation to Russian affairs. Towards the end of January, 1917, the Petrograd police became very active, raising machine-guns to the top of the tallest buildings in the Russian capital; the excuse given was that these guns were intended for anti-aircraft defence. The prosecution of Manouiloff, secretary to and an accomplice of Stürmer, for having extorted 25,000 roubles (about £2,640) from the Bank of Moscow, was begun at Petrograd on the 1st March, and five days later he was convicted and awarded 18 months' imprisonment. The result of this trial should have proved a serious warning to the reactionary party, which had exploited Manouiloff.

On the 8th *idem*, the Council of the Empire refused to allow the prosecution instituted by Stürmer against Milioukoff to be carried to the Courts, his alleged offence being covered by privileges of parliament, although such privileges were not expressly defined by statute.

About this time rumour was busy concerning the probable early dissolution of the Duma and a *coup de force* against those in opposition to the Government. Western Europe was without news from Russia and it was felt that dark doings were in progress.

XXXIII. On the 7th March, the first "hunger strikes" occurred in Petrograd; the bakers' shops were pillaged. The military commandant made it known that the troops would fire on people taking part in

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demonstrations. The situation became gradually worse, a general strike of factory and transport hands was ordered; the printers also downed tools and newspapers could not, in consequence, be published. An immense crowd, still pacific, watched the strikers marching round the city. Violent speeches were delivered before the Cathedral of Kazan, within earshot of the police. Some believe that disguised policemen were amongst the most excited of the orators who harangued the strikers. When the crowd reached the Perspective Nevsky, the Cossacks were ordered to disperse the people; but they merely rode in amongst the people and smilingly raised their whips without using them. The crowd cheered. Soldiers marched out of the barracks to support the Cossacks; but they belonged no longer to the Prætorian army of 1905. These soldiers began to fraternize with the strikers and to crack jokes with them.

The Duma urged, with unanimity, that the revictualling of the large towns should be confided to the Union of Municipalities and of the *zemstvos*, as also the distribution of supplies. The Administration held this to be a vote of censure and a threat. On the same day the Czar signed two ukases at the Russian G.H.Q. suspending respectively the meetings of the Duma and the Council of the Empire from the 11th March to the end of April. Protopopoff made ready to bring the rioters to reason; he had 4,000 police and about 1,000 machine-guns at his disposal.

The 11th March was the decisive day. Long columns of rioters directed their march on the Winter Palace, with the intention of setting fire to it. The police fired on the crowd, but the troops summoned in haste to their aid refused to use their weapons. The police became exasperated and brought their machine-guns into play; street fighting began, which lasted for two days.

The Duma was about to disperse in obedience to the Czar's ukase, as a large number of deputies were wholly averse to a revolution at a time when Russia had a large War on hand. However, a body of 3,000 soldiers, drawn from the Guards regiments in Petrograd, suddenly appeared on the scene and sought instructions from the Duma; Rodzianko at once recognized that, in order to avoid being submerged and to prevent anarchy being given full reign, the Duma must itself take control of the movement. The soldiers were told that the first thing to be done was to get rid of the old *régime*, but that they were not to come into collision with the people. The Duma formed an Executive Committee, with which was soon associated a kind of Committee of Safety, elected in haste by workmen and soldiers. Prince Galitzine resigned, on the date last mentioned.

Rodzianko telegraphed to the Czar, in the name of the Duma, informing him that the situation was exceedingly serious and that immediate action had to be taken; he informed the military and naval chiefs at the same time that a Provisional Government had been formed. During this time, workmen assisted by soldiers had taken possession of the Arsenal, the prisons and the fortress of St. Peter and St. Paul; the occupants of the latter institutions being set at liberty. The Law Courts and prison adjacent thereto were set on fire; the section containing

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the records of the police were in flames for three days—the loss of these records is an irreparable loss to future historians. The police were hunted down and killed ; Army officers who did not wish to be associated with the Revolution were disarmed or shot down by their men. On the 13th March, street fighting continued, the buildings in which the police had entrenched themselves were taken by assault and the defenders massacred. The insurgents next took possession of the Admiralty offices and made the Minister of Marine, who had been abandoned by every one, prisoner. Many of the troops in Petrograd rallied to the revolutionary cause and were received on the steps of the Duma by Rodzianko, who harangued them. Former Ministers, including Galitzine, Stürmer, Stcheglovitoff, Bark and many others were incarcerated ; Protopopoff, more dead than alive, voluntarily surrendered himself to Rodzianko. Soukhomlinoff, who had been under arrest since March, 1916, was brought before the Duma ; the soldiers wanted to kill him, but the Duma spared his life ; he was, however, degraded by having the epaulettes torn off his uniform. The French and British Ambassadors made their way to the Foreign Office and were received with acclamations by the crowds.

On the 14th March, the Revolution spread to Moscow, Kharkov, Odessa and other towns. Troops arriving from the vicinity of the capital received a regular ovation. In Petrograd, a small red flag, the symbol of liberty won, was displayed everywhere. The Duma sent two deputies to Kronstadt, where, after some hesitation, the troops were won over to the Revolution.

The newspapers reappeared in Petrograd on the 18th March, and the city began to resume its normal condition ; the situation was slowly improving. From this date the Executive Committee of the Duma took charge of affairs, it was later succeeded by the Provisional Government and by a Committee, known as the *Tauride*, from the palace of that name where it held its sittings under the Presidency of Tchkheidze.

The *Tauride* was composed of delegates elected by workmen (in the proportion of one per 100 voters) and by the troops that had revolted (in the proportion of one per company) ; it was very unwieldy and noisy. It would listen to no proposals for a compromise, it insisted on a complete break with the old *régime*. An understanding was at last arrived at between the two Committees on the 15th *idem* and a Ministry of National Defence was formed.

The Duma had not foreseen a rupture with the ruling dynasty ; it is just a question whether the majority really desired to go to such extremes ; having been elected under the system inaugurated on the 16th June, 1907 (*i.e.*, under Government and police control), it only very imperfectly represented the opinions of the non-official, urban and the rural classes of Russia. It is this fact that at first seemed to legitimize the active and permanent control by the *Tauride*. But it was recognized that the workmen and soldiers in Petrograd had no claim of right to speak for the whole of Russia, and, in consequence, the *Tauride* forthwith made an appeal to the representatives of every class of workmen and of the Army throughout the Empire. A National Congress, consisting of these representatives, concluded their sitting

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on the 24th April, 1917, by passing a Vote of Confidence in the Provisional Government and conferred on the *Tauride* the right to control the present and future acts of this Government, until such time as a Constitutional Government might be formed.

XXXIV. Nicholas II. was at the Russian G.H.Q. at Mohileff when he learnt, on the 12th March, that events at Petrograd had taken a serious turn. He decided to return to Tsarskoe-Selo, half-an-hour's railway journey from Petrograd, in order to confer with Rodzianko. The Imperial train started at daybreak on the 13th *idem*, but was stopped *en route*; the news came through that the insurgents were in possession of the railway track and that the Petrograd garrison had joined the Revolutionists. "If the people wish it," said Nicholas, "I will abdicate and I will go and live in Livadia," and added with tears in his eyes: "Provided my wife and children are safe!" It was decided to turn back, in order to reach Pskov, the capital of a small Republic destroyed in ages past by the Czars of Moscow; the train arrived there at 8 p.m. on the 14th *idem*.

General Roussky waited on Nicholas II. at the railway station. The Czar declared his readiness to appoint a responsible Ministry. "Too late," was the General's reply. At daybreak on the following day, Roussky was in telephonic communication with Rodzianko for two hours; in view of the turn of events he advised the Czar to abdicate, who, in consequence, decided to adopt this course and a telegram to Rodzianko, announcing his intention, was prepared and signed by Nicholas. This telegram was not despatched as Choulguine, a delegate from the Executive Committee of the Duma, and Goutchoff, a member of the Provisional Government, announced that they were on the way to Pskov; they arrived there at 10 p.m. on the 15th March.

The Czar did not know Choulguine, and he had no liking for Goutchoff, who had been responsible for ventilating the Rasputin affair in the Duma. However, he received both the delegates most courteously in his railway coach, in the presence of Freedericks and General Nariskhine, two Court officials. General Roussky joined them. Goutchoff was the first to speak and advised the Czar to abdicate in favour of Alexis, and to appoint the Grand Duke Michael Regent. Nicholas explained that he felt he could not separate himself from his son, but agreed to abdicate in favour of his brother Michael. The delegates accepted this proposal, at the same time stating that this was not the solution of the difficulty that had been expected. The Czar returned to a neighbouring railway coach and at 11.15 p.m. (15th March) the act of abdication was ready; at Choulguine's request words were added in the document prepared by Nicholas II. to make it clear that Michael was to be a *Constitutional Monarch*. Copies were made of the act of abdication; the Czar signed one copy in pencil, and also nominated Prince Lvoff President of the Council, and the Grand Duke Nicholas Generalissimo in order to provide for continuity of administration. The Imperial train then started off for Mohileff.

The act of abdication signed by Nicholas II. struck the delegates, as it has the whole world, by its style and by the nobility of the sentiments expressed therein. The ex-Czar has neither literary talent nor

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does he fall in the category of "Great Men"; yet the last State document penned by him is comparable to the admirable testament of Louis XVI., and provides evidence that the language of a mediocrity even can reach a high standard in the tragic circumstances under which such a one expiates the error of his ways and miscalculations.

XXXV. Petrograd bore the aspect of a camp on the 15th March. The whole population was in the streets, fraternizing with the soldiers; deputies were haranguing the crowds and urging the people to keep cool; the Entente was acclaimed; the liberal-minded Grand Dukes (Michael, Cyril and Dimitri) were enthusiastically received. A few shots were still being fired by the police, but the majority of them had fled or were in hiding, disguised as workmen or as women; many thousands of the bravest of them had been killed. The ex-members of former Governments were transferred to the fortress of St. Peter and St. Paul. Generals Roussky and Broussiloff, on behalf of their troops, signified their adhesion to the new *régime*; others hastened to follow their example.

The *Tauride* Committee and the Provisional Government, having reached an agreement, published a proclamation granting a general amnesty in respect of all political and religious offences and providing for liberty of speech, etc.; abolition of all restrictions based on social, ethnical and religious distinctions; the replacement of the police by a National Militia with elected chiefs; the election, on the basis of universal suffrage, of a Constitutional Legislature as soon as circumstances would admit. The death sentence, which only existed for political offences, was definitely abolished (16th March). The announcement was made by the French and English newspapers that the Revolution was an accomplished fact; their readers had been without news from Russia since 8th March.

XXXVI. The members of the Provisional Government were selected from amongst the intelligent and most honest of Russia's public men. Prince Lvoff, the most popular man in Russia, the organizer of the *zemstvos*, became Prime Minister and held the portfolio of the Ministry of the Interior. This Government was confronted with an immense task bristling with difficulties, which were enormously increased by the magnitude of the War on hand and the disorganization of the administration owing to the unfortunate practices of the fallen *régime*.

XXXVII. In this subdivision seven separate subjects are touched upon.

1. *The Imperial Family.*—The Grand Duke Michael, the Czar's younger brother, who had been nominated by Nicholas II. as his successor, declined the proffered crown and intimated that he would await the decision of the Constitutional Government yet to be formed; he thus spared his country the prospects of a Civil War.

Nicholas II. was removed from Mohileff to Tsarskoe-Selo, where the fallen sovereign and his family have been kept prisoners. Persons in the immediate entourage of the Imperial family were removed from their society. Some of them, notably Madame Wyrouboff, were imprisoned. Nicholas II. handed over his functions of Generalissimo to his uncle, the Grand Duke Nicholas. Other members of the Romanoff family were removed from the Army, although as an act of courtesy

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Nicholas was addressed as Colonel Romanoff by officers of the Russian Army.

The immense apanage of the Imperial family was converted into national property, to await its disposal for the benefit of the peasantry by the Constitutional Government, when formed. The Czar and his family have been allowed to enjoy the use and benefit of their private fortune of some millions of roubles.

At one time it was thought that the peasantry would rise in favour of the Imperial family, but their devotion to their late Ruler fell to zero almost at once.

2. *The Army and the Navy. Discipline.*—Both in the Army and in the Navy there were some to whom the Revolution was not acceptable, but their resistance was promptly overcome. The outbreak of desertion and acts of indiscipline were the two most serious risks to be feared. Thousands of soldiers, even some at the Front, learning that they were henceforth *free*, believed, or pretended to believe, that they were released from their obligation to serve in the Army and returned to their homes. This homeward rush was accelerated by a rumour which was put into circulation to the effect that the Imperial apanage was to be distributed at once; it became, with many, a question of being in time to obtain their share of the Imperial estates. The Government met the situation by persuasion and not by violence; soldiers were given till the 14th May to rejoin their units. A great number of them returned to the colours spontaneously.

The Government and the Generals set their faces resolutely against the claim now put forward by the soldiers to choose their own chiefs. At the same time, the higher ranks were purged of the inefficients, the decrepits, those in the state of senile decay and the reactionaries; some, for example, Rennenkampff, were put under arrest.

The rank of officer could now be aspired to by every one irrespective of his social class; 300 Jews were immediately admitted into the Military School at Moscow.

The Baltic fleet, disorganized for a short time by acts of indiscipline, was led back into the paths of obedience without any shedding of blood.

General Brussiloff announced that the old discipline of the Army had been replaced by a discipline which, although less mechanical, was more conscientious in its estimate of the duty owed to the country. He did not think the offensive power of the Army had been lessened thereby. The future alone can decide this point.

3. *Industrial Truancy.*—One of the greatest dangers threatening free Russia was the possibility that munition factories might be brought to a standstill, owing to the extravagant pretensions of certain groups of workmen. The Government, seconded by the more reasonable among the Socialists, were able to induce the majority of munition workers to carry on. It was decided to continue work at the Poutiloff factories day and night; the workshops organized by the *zemstvos* were again set to work.

4. *Reprovisioning of the Country.*—The condition of the railways and roads was deplorable; the railway stations were choked. When the United States of America came into the War, a request was made

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to President Wilson for 500 American railway specialists to be sent to Russia in order to reorganize the traffic arrangements on the railways. Great efforts were made to remedy the scarcity of food stuffs in the towns. At the end of three weeks, a considerable improvement had taken place in the situation and the prices of commodities had fallen. The Government formed 405 Regional Committees and charged them with the duty of ascertaining what stocks of supplies were available, to purchase and distribute the same. It is said that vast accumulations of supplies were discovered; this may have been due to an act of the late *régime*, promoted for the purpose of creating a scarcity in the markets, or this may have been due to the greed of the profiteers who wished to exploit the War situation for their own selfish ends.

5. *Nationalities and Religions.*—Poles, Finns, Lithuanians, Ukranians, Caucasians, Mohammedans and Jews all had suffered oppression under the late *régime*, although in unequal degrees. It was necessary to put an end to these persecutions which made intellectual Russians blush for their country.

The Provisional Government was not content merely to confirm the promises made to Poland. An independent Poland, consisting of the territories whose population was largely Polish, was proclaimed; it was granted a Legislature elected on the basis of universal suffrage. Poland remained bound to Russia "by a free military alliance" only.

The Lithuanian question is a complex one; the Lithuanians want *Home Rule*, but if this is granted them, so should it be to the Letts, the Ukranians, etc. The solution of the Russian Home Rule problem would appear to be met by the creation of Federal States, modelled on the type of the United States of America. The question is one that must be tackled in the near future.

In the case of Finland the suppression of the exceptional *régime* was all that was required, and this was done..

So far as the Jews were concerned, an immediate amelioration in their lot was secured by the annulment *en bloc* of the oppressive legislation of Catherine II. directed against this race; thus was secured the emancipation of 8 million Russian subjects by a single stroke of the pen (16th April).

6. *The Peasant Question.*—"Land hunger" is general among the Russian peasantry. After serfdom was abolished, 40 million peasants were required to support themselves on lands incapable of producing sufficient food to meet their needs; to-day this number has increased to 100 million. The industrial policy of Witte, beneficial in most respects, worsened, however, the position of the cultivators of the land. Russia exports too large a proportion of the wheat grown by her and hence her own population experiences periodical famines, sometimes local, sometimes general. Many remedies have been proposed; some reasonable and others unreasonable. In the advanced schools of political thought it has even been urged that the present landowners should be dispossessed without receiving any compensation, on the ground that in the XVI. Century the peasants were deprived of these very lands. Others again, although wishful to see the land transferred from the present owners to the peasants, are for equitable treatment

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being meted out to the farmers; but the sums of money that would be required to compensate existing owners in the event of an expropriation would be so considerable as to render this treatment unfeasible. The Provisional Government has left the final decision of this thorny question to the Constitutional Government; but it may yet have to cope with a dangerous agrarian situation. Many landowners have already been forcibly ejected from their estates and the usurpations must sooner or later be checked *manu militari*.

7. *War or Peace?*—The Provisional Government hastened to assume responsibility for the high contractual obligations entered into by the fallen *régime* and announced that it would continue the War in accordance with the terms of the agreement of 4th September, 1914, to which Russia was a party. Kerensky, in agreement with Tchkheidze, has adopted the formula of a peace "without annexations and indemnities of any sort," and in this respect he appears to have departed from the War aims of the old *régime*. The Central Empires have not been slow to take advantage of the situation in Russia; *inter alia* Lenin, a revolutionary Russian living in exile in Switzerland, has been provided with every facility by the German Government to reach Petrograd *viâ* Germany, in order to preach hatred against Great Britain and a separate Russian peace; however, he has been ill-received in many Russian quarters. The Russian Extremists have, in return for favours shown to their compatriot Lenin, somewhat naïvely issued an invitation to the Germans and to the Austro-Hungarians requesting them to follow the Russian example and to rid themselves of their Emperors and Kings, in order that they may be able more readily to become close friends; but the spectacle of German Socialism throwing in its lot almost entirely with the Government authorities and repudiating republican institutions has opened the eyes of even these Russian extremists.

Kerensky has denied that the Russian Socialists are, as stated in some quarters, willing to accept peace at any price. He has stated that the demands for a separate peace were more frequent under the old *régime* than since the Revolution. "The Socialists," says Kerensky, "are waging a defensive War, they desire no annexations, but are resolved not to take the first steps to secure peace." Nevertheless, he has accepted the principle of reparations and restorations, especially with regard to Poland and Belgium, but he repudiates all idea of *exactions*, without precisely defining his views on the subject.

The workmen delegates on the *Tauride* Committee are imbued with Marxist ideas alone; the Committee also contains soldier delegates, mostly peasants; these latter are not to be easily led astray. An antagonism between these two elements of the Committee early showed itself and is having a very salutary influence. The fact that the United States of America has come into the War will, it is thought, keep Russia up to the mark in loyally fulfilling her international engagements.

XXXVIII. The Russian Revolution was received nowhere with greater enthusiasm than in the United States of America, and it is probable that the fall of the late *régime*, execrated by all Americans, alone rendered possible the entry of this old democracy into the War as a belligerent. The view has been expressed in the *New York Nation*

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(22nd March, 1917) that the Russian Revolution furnished the most complete guarantee that the solidarity in relation to the Entente cause will continue intact to the finish.

XXXIX. In reality, paradoxical as it may sound, autocratic Russia has been democratic for many decades. The ideas which have triumphed in the year of grace 1917 are but those promoted by Speransky in 1809, by the Decabrists in 1825, by the First Duma in 1905. These ideas have been fermenting for a long period, not only in Russian literature, but also in the Provincial and Municipal Unions. Russia has possessed a nobility, but no aristocracy. There has never been in true Russia any class in her social hierarchy corresponding exactly to the Prussian *Junkertum*. The ideas concerning *Liberté, Egalité, Fraternité* have been ripening in Russia as fruits natural to her clime; despotism has never been anything else in Russia than heavy gilt.

Russia is the only country in which one man greets another by the term *brother* without affectation.

History teaches that political liberty is as old in Russia as despotism itself. In the XIII. Century, the Republics of Novgorod, of Pskov were of the type of the Venetian Republic, in which citizens were, from time to time, assembled for the purpose of deliberating on matters of public interest by the tolling of the bells in the belfry; in those days princes who did not meet expectations were ruthlessly dismissed by these citizens from their high office. Later, a centre of autocracy was formed at Moscow; the Muscovites became the Prussians of Russia. The princes of Moscow fashioned their conduct partly on that of the Tartar Khans, whose revenue officers they were, and partly on that of the Byzantine Emperors, the Cesaro-papists.

By 1900 the Russian Government had finally developed into a full-blown autocracy under the heels of a police bureaucracy. The autocracy was of Eastern origin; the bureaucracy was purely German. This autocracy being smashed and this bureaucracy reformed, free Russia becomes the country of great possibilities. The hope of the well-wishers of Russia is that out of the present turmoil there will arise in the Old World an image of the United States of the New World.

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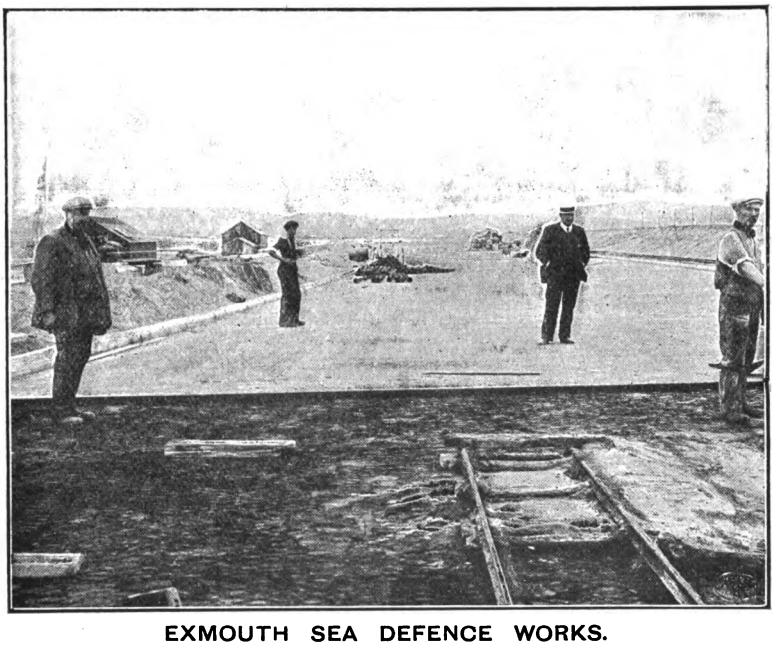

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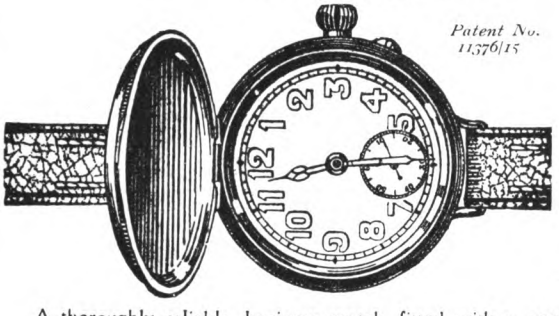

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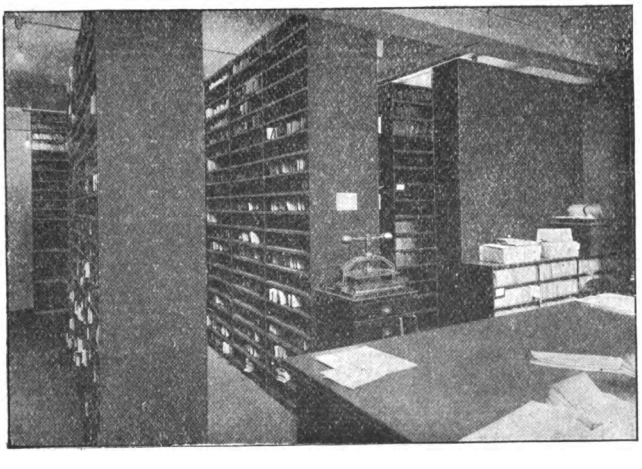

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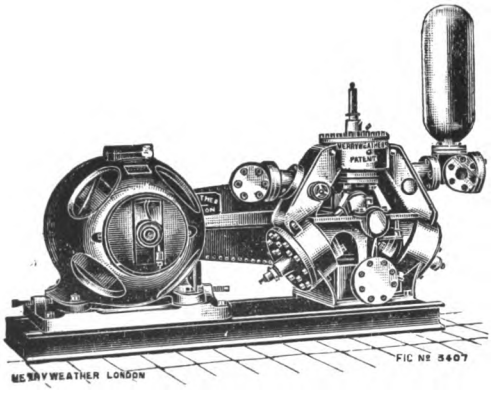


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This toboggan will carry one stretcher or 200 lbs.

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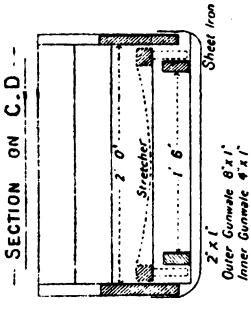


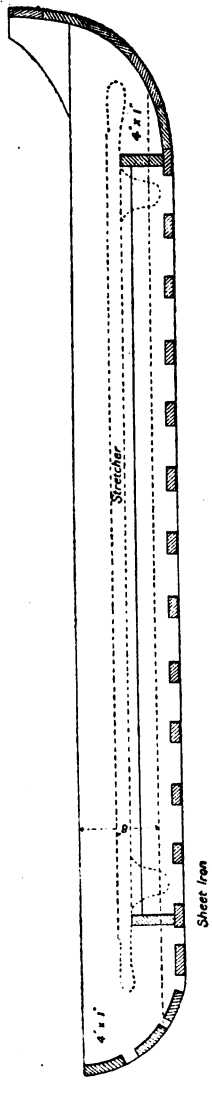


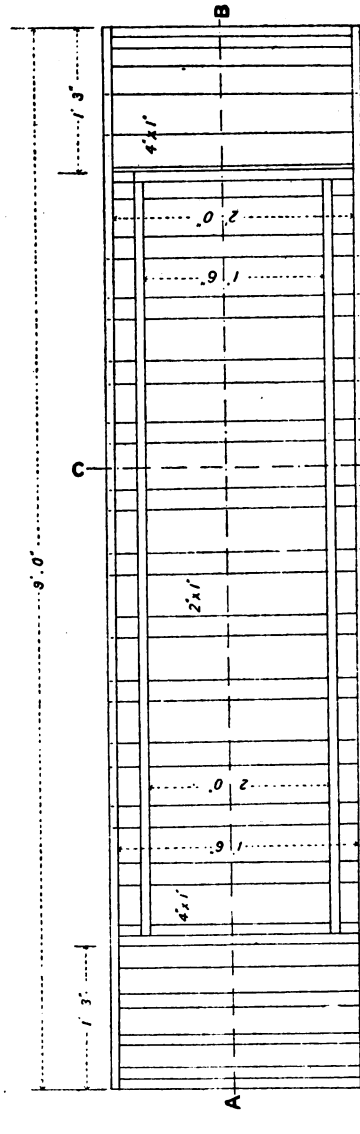


MUD TOBOGGAN.

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## *RIFLE RANGE TARGET FRAME—WINDMILL PATTERN*

*By* Lt.-Col. A. A. Crookshank, R.E., C.R.E., —— Division.

Target frames on rifle ranges in France are usually made either immovable and single, with just the legs stuck into the ground, or movable and double—of the shutter type, with the legs resting on a double wire over a pulley (in imitation of peace-time metal patterns), the two targets running up and down vertically between two posts.

The objections to the latter type are :—

1. Suitable wire and pulleys are not easy to get.
2. The target frame is very liable to jamb.
3. The target frame posts require heavy timber—in addition to that required for holding up the walls of the trench.

In this design the windmill principle is adopted, *i.e.*, one target is at each end of a windmill arm.

The advantages of this type of target are :—

1. The materials used are those ordinarily obtainable.
2. The target frame supports can be used also for holding up the trench walls.
3. Jambing is almost impossible.

Of the windmill target frame, two types suggest themselves, viz. :—

1. A revolving axle, with frame fixed to it. With this type, if the axle is to be used as a strut between the walls of the trench, the earth pressure should be taken by an iron pivot driven into the end of the axle and bearing upon an iron plate fixed to the revetment of the trench walls.
2. An immovable axle, with the target frame revolving on this axle. This enables considerable earth pressure to be thrown on to the axle (used as a strut).

The target can be more easily revolved by the marker and with less strain on the framework ; the moved portion is lighter and more easily repaired, and it is also simpler to make (being devoid of metal work).

In the design shown on page 209, which is of the latter type, the following points should be noted :—

1. Two sizes of targets can be used, viz., 6 ft. × 6 ft. and 4 ft. × 4 ft.

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2. The bearing is made as long as possible, to keep the revolutions true and free, especially when there is wind pressure on the face of the target.

3. The central portion of the frame (between the two targets) is made as small as possible, to reduce the depth of the trench. The targets are consequently placed on opposite sides of this central portion.

4. The legs of the targets are held against horizontal movement, by wooden dees, and against vertical movement by dowels or pins (to prevent the lower target from running out when it gets below the horizontal).

5. The targets are in a plane, inclined (towards the firing points) at 4 degrees, the inclination being given by shaping the axle. This enables the marker to see each hit on the target, although the trench is kept very narrow. It also gives more room for the markers' feet and for movement in the trench.

6. The planes of the targets are "staggered," *i.e.*, kept 6 in. apart to enable them to be placed close together without fouling each other and to thus reduce the length of the trench.

7. The target frames are placed at 12-ft. centres to enable the horizontal strut of the intermediate revetting frames to be placed at a suitable height (about one-third of the way up the wall of the trench). The small amount of trench traffic can easily step over these struts.

8. The targets are held in position when in action and under fire by two small wooden battens, one on each side of the lower target. The battens are loose (movable), and are placed by hand across the trench in notches in the lower of the two 3-in.×6-in. horizontals.

9. As regards holding up the walls of the trench, the revetting frames which carry the targets are of this type, the ground sill being countersunk flush with the floor of the trench, so as not to interfere with movement in the trench.

Other revetting frames are placed half-way between the target supports; they are of this type :—

The trench walls are thus supported at 6-ft. centres.

The walls are panelled with wire netting, expanded metal or corrugated iron, held by two horizontals (of 3-in.×6-in. timber), one at the top of the wall and one half-way down, also by wooden pickets at the bottom, driven into the trench floor.

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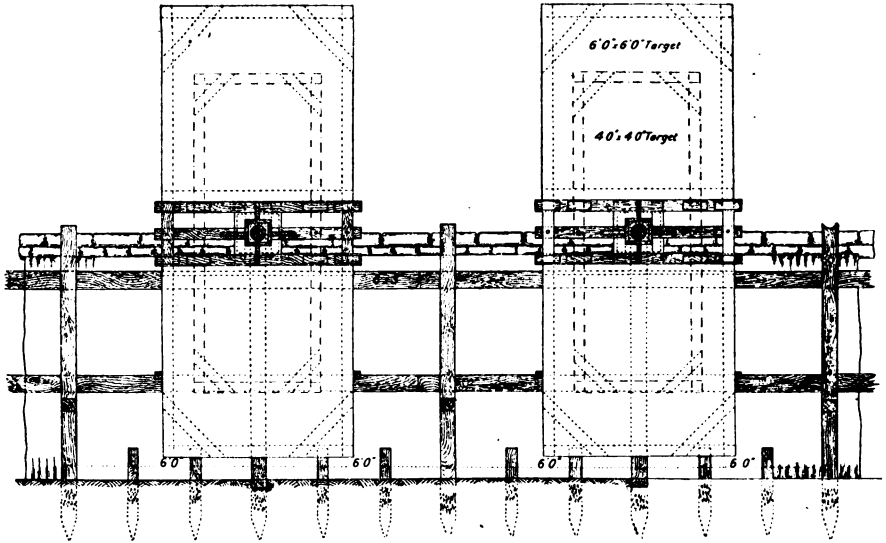
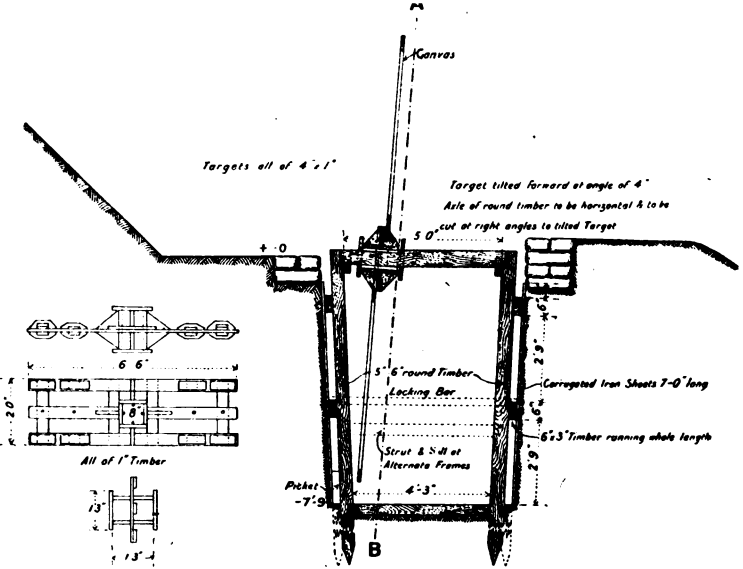


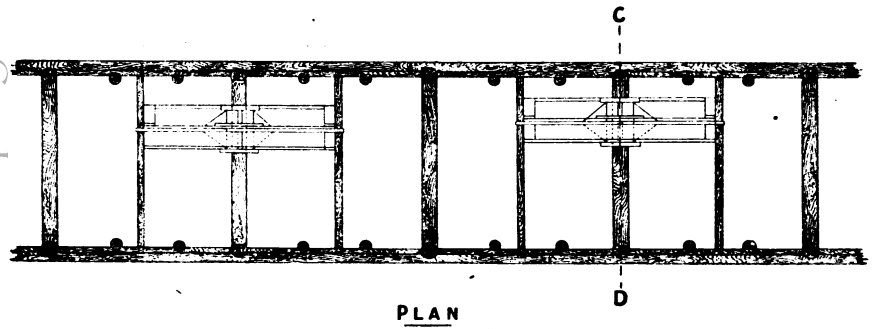

LONGITUDINAL SECTION ON "AB"




DETAIL OF CENTRE


A
Canvas
Targets all of 4"×1"
Target tilted forward at angle of 4"
Axle of round timber to be horizontal & to be cut at right angles to tilted Target
5'0"
+0
5"×6" round Timber Locking Bar
Corrugated Iron Sheets 7-0" long
6"×3" Timber running whole length
Strut & Sill at Alternate Frames
Picket -7'9"
4'-3"
B

CROSS SECTION ON "CD"




PLAN

# RIFLE RANGE TARGET FRAME

## WINDMILL TYPE

SCALE - 1:24.

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10. The revetting shown in the design is exceptional; the trench was dug in a steep valley-side:—a moraine slope of small grained (almost powder) chalk—almost as bad a face to hold up, after the protective armouring of bushes and shrub roots had been pierced, as could be met with—a berm 5 ft. wide had to be left on the uphill side and continuous corrugated iron panelling was a *sine qua non*.

I have had valuable suggestions for this design from Major A. C. Finnimore, R.E.

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# *REVIEWS.*

## A SHORT ACCOUNT OF EXPLOSIVES.

*By* A. MARSHALL.—(Messrs. J. & A. Churchill, 7, Great Marlborough Street).

THE author's object is, as he says in a brief preface, to present in a clear and simple manner the main facts concerning explosives and their properties in the hope that those who read the book will carry away a clear conception of the different varieties. In this he has certainly succeeded.

The book, which is a much condensed edition of his larger work, *Explosives*, commences by briefly outlining in an introductory chapter the general nature of explosives, and the methods of dividing them into various classes according to their composition, their properties, or their uses. In succeeding chapters he discusses Black Powder and similar mixtures, Nitrocellulose, and Nitroglycerine and Nitroglycerine Explosives, touching briefly on their history, and going more fully into their composition and methods of manufacture. Commercial explosives of many kinds, Smokeless Powders, which include the modern propellants of most European nations, and Fireworks are each given a chapter, as are also Properties of Explosives and Precautions for factories and magazines.

To the military engineer the most interesting chapters are those on Military High Explosives and Ignition and Detonation. The former includes such explosives as Lyddite, T.N.T., and Ammonal; as well as various types of shell and hand grenades, whilst fuzes are not neglected, being included in the chapter on Ignition.

It will be seen that the book, which is well and profusely illustrated, has a wide scope; as it deals not only with explosives themselves, but also with the different forms in which they are packed for express delivery to the unwilling recipient.

Mr. Marshall has succeeded in compressing a very large amount of information into a small space, and yet has avoided the appearance of overcrowding. To the man whose dealings with explosives are confined to their dissipation rather than their manufacture the book is of more academical interest than practical value; but to anyone who wishes to gain a further knowledge of their why and their wherefore it can be recommended with all confidence, if only as an introduction to deeper study.

J.D.B.

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## PAGES D'HISTOIRE, 1914—1917.

(Librairie Militaire Berger-Levrault, Paris: 5, Rue des Beaux-Arts).

The 132nd number of this series is entitled *Les Dévastations Allemandes dans les Départments Envahis* (*Mars—Avril*, 1917). This volume deals with the wanton destruction carried out by the Germans in Northern France; four photographic views are reproduced which give some idea of the completeness with which the twentieth century Huns have ravaged the fair lands of France up to recently in their possession.

The volume is provided with a preface by Monsieur Henri Welschinger, which practically constitutes a summary of its contents. Monsieur Welschinger tells us that, having in mind the reports of the Official Commissions of Enquiry in which are faithfully enumerated the crimes of which the German troops have been guilty, since the first days of the War, in Belgium, in France, in Serbia, in Poland and in Roumania, recalling the clear and damning account of their criminal doings set out by Monsieur Mirman, the stout-hearted Prefect of the Meurthe-et-Moselle, it seemed inconceivable that these creatures, who are human beings in name alone, could have found it possible to commit acts of greater horror or to sink to greater depths of infamy than those related in the records referred to. Nevertheless, unthinkable as it may appear, the extreme limits to which the Germans were prepared to go in their orgy of atrocities had by no means been reached by them until very recently; indeed, not till the irresistible pressure of British and French arms drove them out of the positions so long held by them north of the Somme did the Germans demonstrate the lengths their spirit of vengeance was capable of carrying them. The ravages committed by them in the towns, villages and countryside through which they passed in their retreat to the "Hindenburg Line" were such as to cause a storm of intense indignation to sweep through every part of the civilized world as soon as the facts connected therewith became known. A report on the subject having been made to the French Senate recently, it passed the following resolution on the 31st March last and ordered it to be publicly exhibited in every Commune in France:—"The Senate hereby publicly denounces the criminal acts committed by German troops in the territories of France until recently occupied by them, consisting in offences against private property, against public buildings, against the honour, liberty and lives of persons;

"It hereby declares that these acts of unprecedented violence have been perpetrated without the shadow of an excuse and without any military necessity; indeed, in wilful defiance of the provisions of the International Convention of the 18th October, 1907, ratified by the representatives of the German Empire;

"It holds up to universal condemnation the authors of these misdeeds, to whom should, in the name of justice, be meted out the punishment they deserve;

"It salutes with respect those who have been victims; to these the Nation makes a solemn promise and gives a binding pledge that the enemy will be made completely to indemnify them against their losses;

"It further affirms that it is the will of France, sustained by her brave

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soldiers and in accord with the wishes of the peoples of the Allied countries, to pursue the conflict forced upon her until German Imperialism and Militarism, forces which have been responsible for all the misery, all the ruin and all the mourning brought upon the world, are definitely crushed out."

At the sitting of the Senate at which the above resolution was passed, Monsieur Henri Chéron, Senator for the Calvados, gave an account of what he and delegates of the Senate had seen during their visit to the territory recently vacated by the German forces. Put shortly, they found that all ranks of the German Army had treated the provisions of the Hague Conventions with the same disregard that von Bethmann-Hollweg treated the Solemn Contract whereby Germany had undertaken to safeguard and respect the neutrality of Belgium. Monsieur Chéron employed no exaggerated language when he stated that one would have to go back to the remotest periods of history to find a record of acts of savagery and devastation at all equal in atrocity to those committed by the Germans in the recently evacuated French territory. Even then it would be impossible to find anything disclosing conduct so outrageous as that of the Germans in Northern France.

The delegates of the Senate visited many towns and about 50 of the villages until recently in German occupation. Everywhere there existed visible signs of German barbarity: farm buildings in ruins, residences burnt and pillaged, strong boxes blown up with dynamite or forced with burglar's tools, sepulchres violated, coffins emptied of the remains of the dead and filled with filth, household goods of all kinds smashed to atoms or disfigured, orchards stripped bare, trees barked and sawn through, wells either filled in or poisoned, etc., etc.

The recital in the French Senate of the acts of pillage, destruction and systematic barbarism of which the German troops have been guilty, and to which the members of the French Commission of Enquiry bear testimony, moved many Senators to tears of sympathy for the sufferers from German vengeance, and, at the same time, led to demonstrations of intense anger against the perpetrators of the diabolical acts in question. These acts, be it remembered, were committed by members of that Nation which is so proud of its *Kultur*, of its incomparable civilization (*sic*), of the nobility in character of its people, and its honour as to prompt it boastfully to claim superiority over all other races. Having pledged itself to respect private property, to proscribe pillage, to become administrators and usufructuaries only of public buildings, forests, lands, etc., of an enemy State; having forbidden the seizure, destruction or violation of public institutions, churches, schools, hospitals, museums and historic monuments in an invaded country; having ratified the articles of Conventions which provided that the civil population of invaded territories would be safe-guarded and placed under the protection of International Law; having accepted the usages and customs of civilized nations, the rules governing humane conduct and the dictates of public conscience as guiding principles by which to control its own acts in a theatre of War, nevertheless the German Nation has seemed to take downright pleasure in doing evil; voluntarily, knowingly, even joyfully, it has trampled under foot all rights, all principles, all rules,

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all laws. And turning to those broken in heart at the destruction of their towns and villages, witnessing as they did the transformation of a flourishing countryside into a hideous desert, the Germans have taunted them with cruel banter and a savage sneer, telling them: "We offered you peace, you would have none of it . . . You have only yourselves to blame now. This is the consequence of your refusing our offer." One can only say what Tacitus long ages ago said of barbarians of earlier times:—*Ubi solitudinem faciunt pacem appellant!* (In the desert made by them, there reigns that which they call peace!)

The conduct of the Germans has been so villainous throughout this War that it is no longer possible to credit them with possessing the smallest sentiment of honour or of justice. When reproached with their misdeeds, they merely reply that they are carrying out the orders of superior authority; they are but exercising the rights of a conqueror, etc., etc.

Not only have the Germans committed acts of theft and pillage, but they have proved themselves guilty of indescribable acts of filthiness; they have, in their mode of life in the occupied territories, seemed to vie with the harpies.

Not satisfied with pillaging, sacking, robbing, ruining, burning and ravaging in all directions, the Germans have even gone the length of wilfully destroying fruit trees in order to reduce the productiveness of the land and to dissipate the capital wealth of the poorer people. Having failed to break the spirit of the French people, the Germans have vent their rage in this stupid manner on things inanimate. But even acts of this kind shrink into insignificance when placed by the side of the maltreatment and cruelties inflicted on the old and on the young, on those of the weaker sex as well as on those of the stronger. Great then, as may be imagined, was the joy of those who, having been practically slave-driven for nearly two years and a-half, were able, early this year, once more to live under the rule of the tricolour and to welcome French and British soldiers in their devastated homes.

It is felt that an example should be made of those who have been guilty of the misdeeds and crimes committed in the occupied territories. It is urged that in the interests of Morality, of Justice and of the Law those of the enemy who have committed excesses of the grosser kind in French and Belgian territory should be indicted and brought before the bar of an International Supreme Court in order that the charges against them may be regularly investigated, and judgment entered in due form of law against those found guilty. This done they should be sentenced and made to undergo that punishment which best fits their crimes, as indeed the Resolution of the Senate voted on the 31st March last contemplates shall be the case.

The French Commission of Enquiry appointed to investigate the violations of International Law by the enemy recently travelled through the portions of the Oise, Aisne and Somme regions liberated from German domination and have addressed a report to the French Premier, in which the statements and accusations reported to the Senate by its own delegates are fully confirmed. The Commissioners report that the nature of the ravages which came under their notice during their visit to the liberated

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regions was such as to leave no doubt in their minds that the Germans had acted deliberately on a considered plan, every detail of which had been carefully worked out by them. They refer to the state of servitude in which the French people had been obliged to live under German rule, to the carrying off of women and young girls, to the acts of pillage committed in private dwellings, to the havoc done in towns and villages, to the ruining of industries by the destruction of machinery, to the laying waste of the countryside, to the shattering to pieces of implements of agriculture, to the burning down of farmhouses, to the tearing down of trees. All these misdeeds were committed simultaneously and with the most savage ferocity, no doubt with the definite intent of increasing the misery of the poor victims, of inspiring terror in them and in order to create a spirit of the deepest despair. Before entering upon the latest of their acts of barbarism, the Germans began by seizing a certain number of French citizens as hostages, by shooting certain unoffending inhabitants, by arresting *soi-disant* spies, by requisitioning supplies and goods, by levying enormous contributions (in specie), by multiplying the vexatious acts to which the French people had been obliged to submit, by taking from the shops (without payment) whatever they wished to have, by inflicting severe penalties for the slightest infractions of their Draconian rules and regulations, lastly by doing violence to women and young girls. It was in the month of February last that the conduct of the Germans became more outrageous than ever, *i.e.*, at the time that the preparations for their retreat from the Somme were put in hand. They had already removed French subjects from their homes in order to employ them in Germany and in Northern France; they now increased the extent of these operations regardless of the complaints and protests of their victims. The unhappy people, among them invalids, were torn from their homes by force and subjected to such severe ill-treatment that many died daily. The details of the cruelties practised by the Germans are so revolting as to sicken even the stout-hearted. It is said that von Bissing and von Fleck not only ordered the infamous deeds to which attention has been drawn but personally initiated them; whilst people like Schinderhannes heartily approved of them. The German 338th Regiment is said to have behaved particularly disgracefully in this connection. When it was about to leave the village in which it had been quartered, the officers of the regiment ran along the streets, firing revolvers at the windows of the houses in order to excite their men to acts of destruction.

It is not only against inanimate things and the living that the disciples of *Kultur* wreaked their vengeance. They have even exhibited their hatred by profaning and despoiling the tombs of the dead and by disturbing the ashes of those who passed to their eternal rest many decades ago. German soldiers have broken open coffins, hoping probably to find articles of value therein; the remains contained in these coffins have, in many cases, been turned out on to rubbish heaps. Such is the respect in which the Germans hold the dead. At one time, their behaviour in this respect might have caused surprise and might have been looked upon as the isolated act of a few madmen. But in view of the recent disclosures concerning the *Kadaververwendungsanstalt*, a company

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with a capital of 5 million marks promoted with the object of utilizing the waste of the battlefield, the corpses of combatants and the carcases of animals, for the purposes of the manufacture of munitions and for the feeding of swine, one must regretfully conclude that the misdeeds in question were not the acts of a few whose minds had become unhinged, but were acts indicating the mentality of an entire race, whose whole code of ethics has become perverted by reason of its successes in former wars of a half century ago, by its discoveries in the fields of science and by its material progress in the fields of commerce and the industries.

The most disturbing feature of the situation is that the Germans have been led to believe by the pastors of the Lutheran Church that they are a people beyond reproach. These guardians of public morality have held up France as being the home of laxity and frivolity, whilst extolling the demeanour and conduct of their own people. This is what Pastor Rumps, of Berlin, is reported to have said recently :—" William II. is a veritable knight by the Grace of God, a sovereign and a prophet by the same token. The Germans are altogether innocent of having started this War and evidence has, since its commencement, been flowing in from all quarters regarding the noble and chivalrous manner our troops have conducted themselves in all things ! . . . How can the sons of France have any enthusiasm for a War such as that now in progress ? They know not for what they are fighting, whilst we Germans are aware that what we are fighting for is *Kultur* and our religion, for right and morality, for our very life and well-being." He has had even the effrontery to proclaim that the Almighty was safeguarding German submarines in their warfare against the Allies' merchantmen. The hyprocisy of German pastors in the matter of the War would be hard to beat ; much blasphemy has been poured by them into the ears of their parishioners, during the past three years, in the sermons which have been delivered from the pulpits of German churches. The *noble souls* of the German, it has been claimed, are formed out of the gold of Luther, the silver of Goethe and the iron of Bismarck. It is souls of this alloy that are capable of invoking the Almighty in the following terms :—" Oh Thou that dwellest in the high heavens above with the Cherubims, the Seraphims and the Zeppelins send down, we exhort Thee, Thy light and lightning, hail and tempest upon our enemies ! Let them be blasted into the deepest craters dug by our shells ! Help us to punish, with Thy holy anger, all those who seek to appropriate to themselves Thy Crown ! "

There can be little doubt that it is utterances of the nature of the above that have been responsible for the burning fanaticism, the unprecedented rage, the mad excitement of the crowds that have been guilty of acts of pillage, violation, torture, arson and indiscriminate slaughter. Much evidence is available to prove that the acts of destruction chronicled were not committed in the heat and excitement of a battle but were deliberately planned. Orders issued by the commanders of the German troops have been found from which it is clear that, in March last, it was decided to use dynamite and the torch in order to destroy the property of the French people. Special parties were formed for this purpose and named *Brandkommandos* (Torch Parties), *Sprengkommandos* (Ex-

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plosives Parties), *Zerstörungskommandos* (Demolition Parties). In the XVII. German Army Corps, the officers and N.C.O.'s for these parties were found by the 17th Pioneer Battalion. Each company of the Corps was required to furnish five men, drawn from the cripples of the unit, for the several parties enumerated above. In the case of one of the battalions of the corps no volunteers were forthcoming and it became necessary to detail the required number of men. Accounts of the work done by the *Kommandos* in question have appeared in the German Press which has given its whole-hearted approval to these infamous proceedings on the part of the German military authorities.

Comparing Attila, the King of the Ancient Huns, with William II., Emperor of the Modern Barbarians, the opinion is expressed that the former was really a less cruel tyrant and indeed a more generous conqueror than the latter, whose hordes have not hesitated in conducting this War to make use of the worst abominations that science has put within their reach; they have banished from themselves all the old chivalry formerly associated with the profession of arms. Attila, it has been said, fully established his claim to the title of the Scourge of God by which he is known; what then is the appellation by which William II. will be known in the ages to come? Inexplicable crimes have been committed in his name with unsurpassable ferocity; so barbarous have some of these crimes been that an *Instrument of Satan* can alone have been responsible for them.

The well-known American authoress, Edith Wharton, has recently visited the devasted regions; she has called these regions the "Land of Death." The utter desolation of the countryside through which she passed has aroused in her a feeling of intense indignation; she has stigmatized the acts of insane cruelty committed by the Germans in unmeasurable terms. The only result of German savagery, she tells us, has been to create a revengeful hatred in the hearts of the peasantry, their victims, and of the French soldiers now at the Front against the perpetrators of the dastardly misdeeds in question.

Others who have visited the same scenes are as severe in their condemnation of this explosion of bestiality as is Edith Wharton.

Needless to say that so far as there may have been an intention on the part of the Germans to hinder the advance of the Allies, by the laying waste of the countryside, their efforts entirely miscarried. French and British soldiers braced themselves to overcome the obstacles placed in their way. What seemed to the German to be unsurmountable barriers were quickly passed by horse, foot and guns. It was the Army of Vengeance that followed the retreating foe to the "Hindenburg Line!" Thirty-five thousand prisoners were taken by this Army, and this was but a part of the penalty paid by the Kaiser's hosts; they also left about 300 guns and more than 1,000 machine-guns in the hands of their pursuers, and the corpses of 100,000 Teuton soldiers strewed the routes by which they had retreated. The whole conduct of the Germans exhibits the same appearance of despair as that shown by wild animals when they stand at bay on being driven into a tight corner. They are being by degrees slowly hemmed in and the day cannot now be far distant when the whole world will witness the collapse of that nation which, by

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reason of the excesses committed by its members, has brought the human species to shame and has caused disgust in those possessing the smallest spark of humanitarian feeling.

In the market square of Peronne, in the midst of the terrible scenes bearing testimony to their spiteful fury, German officers, before departing, chalked up, on an immense board, the four words :—" Nicht ärgern ! Nicht wundern ! " that is to say, " Don't lose your temper ! Don't be surprised ! " No one who is aware of the atrocities committed in France, in Belgium, in Serbia will be in the least surprised at this display of brutal cynicism. Can it be wondered then that France is ardently looking forward to the day when Germany will be made to pay the full penalty for the multitudinous and abominable crimes of which she has been guilty since the first days of August, 1914 ?

It is urged that when peace reigns once more and thriving towns and villages have sprung up on the ruins of to-day, where so much sorrow and suffering have been experienced, commemorative tablets, containing a record of German misdeeds, their dates and a brief outline of the essential particulars, should be placed in the churches and Town Halls, in order to remind posterity of incidents which nothing can or ought to efface from the memory of future generations of Frenchmen. The hope is expressed that the weakness and indifference shown with regard to similar matters after the War of 1870—1871 will not be repeated at the conclusion of the present conflict. The French Foreign Office has taken the initial steps in the matter; it instructed its diplomatic representatives in Neutral Countries, on the 24th March last, officially to communicate to the Powers to which they were accredited, a detailed report of the ravages committed by German troops in the French territories recently evacuated by them and to enter a protest regarding this conduct of the enemy.

The German manual relating to the customs of War—*Kriegsbrauch im Landkriege*—sets out the correct principles relating to the treatment of the civil population and their private property by an invading army ; these principles, however, have been completely ignored by German officers of all ranks. The opinion is expressed that the Allies should be done with brave words, eloquent speeches, and demonstrations of all kinds. The fear of reprisals, the application of the *Faustrecht*—Fist Law—will alone make the German barbarians desist in working their criminal intentions against the unoffending civilians. It is urged that before it is too late and in order to prevent the sacking and destruction of Lille, Roubaix, Tourcoing, Cambrai, Brussels, Strassburg, Metz, etc., Germany should be plainly told that the principle of the *lex talionis* will be applied by the Allies, and that for each town sacked or destroyed in France or Belgium a town in Germany of equal importance will be laid waste by the Allies ; for example, Munich will have to answer for the destruction of Brussels, Nuremberg for that of Ghent, Essen for that of Lille, Cologne for that of Strassburg, Mannheim for that of Mulhausen, Mayence for that of Metz, Frankfort for that of Roubaix, Stuttgart for that of Turcoing, etc. Those who are inclined to oppose the adoption of this course of action are recommended to pay a visit to the devastated region before raising their voices in opposition ; if they are unable for any reason to do this, then let them carefully study the photographs

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showing the German handiwork in this region. They will then be in a better position to judge whether the situation is one which would justify moderation and generosity towards the invaders. They should remember too that the German Press has with cynical indifference to the opinions of the World at large openly admitted the crimes charged against German soldiers and has gloried in the misdeeds of the latter; illustrated papers such as the *Illustrite Zeitung* of Berlin have even taken a savage pleasure in reproducing photographs of the *Sturmtruppen* in the act of breaking, burning and blowing up towns, villages and isolated cottages.

In order to stimulate the consciences of the over-sensitive they are reminded of the views held in Germany contained in the following excerpts:—Was it not the Germans who on the 30th July, 1914, said: "Poor France! It will not this time be a question of an indemnity of five milliards (200 million sterling), but she will be made to pay thirty milliards or even more! The lovely Mother of Lourdes, miracle worker though she may be, will have her job cut out if she attempts to undertake the setting of the bones of all the poor devils on the other side of the Vosges, bones which our men will be breaking . . . France will feel the effects of our blows for many generations to come." Was it not Bismarck who prophesied: "The War in 1870 will be only child's play as compared with the next War. The conqueror of the future will bleed the vanquished white." And von Bülow, has he not said of the French: "What matters their hatred?—*Oderint dum metuant!* That they hate us, may be; but there is no question that they fear us!"

The Germans appear to be immensely proud of the fact that they are cordially hated in all quarters of the globe, as witness the applause with which Professor Rœtger's remarks were received in April last on the occasion of an address to a vast crowd on the 102nd anniversary of Bismarck's birth when he said: "*Wir sind das bestgehasste Volk der Welt und wollen stolz darauf sein.*" (We are the best hated people in the whole world, and we are proud of the fact).

Monsieur Welschinger concludes with a message to the victims of the German outrages; France has heard their cry of anguish and their outburst of righteous anger, and he says to them:—"Have confidence in the Almighty, and in us. Justice will be meted out!"

The remainder of the volume is devoted to the proceedings in the Senate at the meeting of that body held on Saturday, 31st March, 1917. The President, Monsieur Antonin Dubost, on this occasion announced that a motion had been placed in his hands denouncing the criminal acts committed by the enemy in the regions of France until recently occupied by them; the terms of this motion (*vide* the resolution quoted earlier in this article) were accepted *nemine dissentiente*. The speeches delivered at this meeting of the Senate are reproduced *in extenso* in the volume under review. The volume also contains appendices, three of which give particulars relating to the villages destroyed by the Germans in the Pas de Calais and in the Aisne regions and in the Department of the Oise. In a fourth appendix are reproduced the texts of the 8th and 9th Reports of the French Commission of Enquiry appointed on the 23rd September, 1914.

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The volume concludes with extracts from the German, American and Swiss Press, dealing with the German acts of vandalism, etc.

The 133rd number contains the official communiqués issued by the Central Government to the French Provincial Authorities during the month of April, 1917; it is the XXIX. number of the series dealing with this subject. The volume is provided with appendices; these consist of the text of the telegram sent by the President of the French Republic to President Wilson expressing the appreciation of the Western Allies for the active support the American Nation is about to give them on joining up as a belligerent, and the American reply thereto; the message of sympathy delivered in the Senate by Monsieur Antonin Dubost to the Council General of the Isère on the 16th April, 1917; the text of the telegram sent by King George V. to President Poincaré on the 23rd *idem* congratulating him on the successes of the French troops and the latter's reply thereto.

The 134th number is entitled *L'Alsace-Lorraine sous le joug qui se brise;* in it Monsieur Émile Hinzelin describes briefly how weighty a burden the German yoke has been to those dwellers in these provinces whose sympathies lean towards France, a yoke from which, it is hoped, they will soon be liberated.

Monsieur Hinzelin tells us that Germany claims to have effectually provided for the silencing of Alsace-Lorraine, but as a matter of fact the present sufferings of the Alsatians and Lorrainers are well known in France. Every important item of information finds its way through the curtain of iron hung between the people of these provinces and the French people. So strong is the bond of sympathy between France and the lost provinces that even the most pitiless oppression cannot prevent clandestine correspondence from passing between those in the Motherland and those under the German yoke.

That the lot of French sympathizers is an extremely hard one no one will doubt. The Abbé Wetterlé has made the world acquainted with the severity of treatment meted out to one Meyer. Meyer was a member of a business house in Mulhausen and was accused of carrying letters intended for France into Switzerland. He was found guilty and sentenced to imprisonment for life. One of his judges advised him to appeal against this sentence and the unfortunate man followed the advice given him. The Appeal Tribunal promptly condemned Meyer to death; the sentence was duly carried out. The newspapers of French sympathy having all been suppressed at the beginning of the War, only those run in the Pan-German interest are now being published in Metz. It is an offence in some in that they see and a still greater one in that they but speak, as a certain Madame Genneson of Metz found to her cost. Some French aviators flew over the Sablons railway station at Metz and were fired at by the Germans; one shell from a German field gun, falling in the Place Saint Louis on this occasion, killed Monsieur Genneson. The *Metzerzeitung* and the *Lothringerzeitung* thereupon launched diatribes in which they stigmatized the Allies for their barbarism in making War on unoffending civilians! Madame Genneson replied to these attacks by stating that she saw her husband killed and that he was hit by a 77-in. shell which exploded on the pavement. She was at once put into prison for circulating false information.

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Naturally the Pan-German Press desire the world to believe that the people of " Alsace-Lorraine wish to live under the German flag," and have been conducting a campaign to this end. Yet these are the same people who are threatened with imprisonment for a term of 12 months in a proclamation issued by the German General Esa, on the 19th October, 1916, should they fail to respond to the call for workers.

Their recent experiences have made the Alsatians and Lorrainers more eager than ever to be delivered from their German taskmasters to the tender care of France, and they await the dawn of their new liberties with an intense longing.

The hunt for copper has extended into Alsace-Lorraine. Objects which for centuries have been held in veneration, and have practically been treated as heirlooms, have been taken from their possessors by the Governmental Authorities for conversion into munitions of War.

The petty persecutions which the Germans are continually inventing are in keeping with their whole character; one of the latest of their pin-pricks has been to compel the Alsatians and Lorrainers to remove the inscriptions in French on the tombstones of their dead, and to replace them by inscriptions in German. For some years past, a decree has been in force that new epitaphs in French would not be allowed in Alsace and Lorraine, but the then existing tombstones were not interfered with. But now the dead of centuries ago are no longer permitted to lie in peace under the slabs bearing the words: " Ici repose . . . " which had sounded so comforting to their ears in their lifetime.

Many of the towns of Alsace and Lorraine are to-day deserted. In driving the wretched folk from their homes, the Germans have taunted them saying: " You did not wish to belong to the German Empire. To be quits Germany does not want your company; she will plant true Germans here." This is really nothing new. When Germany found years ago that her attempts to germanize Alsace-Lorraine had been fruitless, she announced openly that " the Alsatians and Lorrainers must yield or depart; there could be no middle course." This feeling became particularly strong after the Forstner affair in 1912.

Some of the information which leaks through from Alsace-Lorraine is extremely touching. Recently some French prisoners were being conveyed through Strassburg by train. They noticed an old woman in Alsatian dress on the platform and they saluted her. The old lady burst into tears, and this was a signal for all the women and children present there to do likewise. The German authorities were nonplussed; their regulations are not yet sufficiently comprehensive to meet a situation of silence and tears.

One of the most powerful weapons in the hands of any State, whether in times of peace or in those of war, is that connected with the sequestration of a person's property. It is needless to say that the German authorities have been particularly busy making a full use of this weapon in Alsace-Lorraine. Every day lists are published of properties against which writs of sequestration have been issued by the authorities. In some cases it is the property of a foreigner which is attached, in others that of an absentee who is treated as a deserter, or even that of the relatives of a deserter. By German Law, the *Zwangsvernwalter* or Trustee of the

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Sequestered Properties administers such properties "in the interest of the economic welfare of Germany as a whole" and not in the interest of those who are normally looked upon as beneficiaries in such cases. A great deal of the funds which have come into the hands of these Trustees have been diverted to purposes connected with the War and in the purchase of War Loan Certificates.

To-day French is totally proscribed in Alsace-Lorraine. It is an act of treason for a mother to give her infant daughter of eight directions in French, in the public streets, to open her umbrella. Parents too must suffer for the indiscretions of their offspring. A youngster of six began to sing the *Marseillaise* in Strassburg. The police immediately arrested his father, who was taken before the magistrates and duly punished.

The attachment of France to Alsace-Lorraine is, as everyone well knows, very deep. The six and forty years of German occupation have made these provinces something of an enigma to Frenchmen; some forget that during this period there has been a continuous immigration into Alsace and Lorraine, so that at the beginning of the War 400,000 out of their population of 1,874,000, *i.e.* about 20 per cent., were Germans.

When the French made their advance into Alsace in the early days of the War, some of the officials in that province were placed in an extremely difficult predicament. At heart they were French, but, being in doubt as to the permanency of the French occupation, they were not able openly to show the direction in which their sympathies lay. It is said that when a certain French battalion arrived in one of the Alsatian market towns its Commander ordered the Mayor to hoist the French tricolour. This official was an ex-officer of the French Army and absolutely loyal to France, but he declined to do as he was ordered. The Battalion Commander had him arrested and hoisted the French flag himself. A few hours later the French were obliged to evacuate this town, but before doing so they released the Mayor. The Germans followed quickly on the heels of the French, and finding the offending bunting still hanging out over the door of the Town Hall, they in their turn arrested the Mayor and put him into prison. On such occasions, after the French had evacuated any town, the Germans seized a certain number of old men and women who were regularly denounced by the German *immigrés* as being those who had welcomed the French. The Germans made short work of them; they were lined up against a wall and shot forthwith. It is said that these poor people met their death with great fortitude. Many examples are given of the severity of the sentences passed upon the residents in Alsace-Lorraine for quite trivial acts, scarcely amounting to an offence except in accordance with the German code.

Nearly every male person has by now been removed from Alsace-Lorraine by the German authorities. The majority of them have been sent to fight against the Russians and have suffered very heavy casualties. Even where young men have received their education in German Universities, they have shown most decided French sympathies. So much so that the Prussian Ministry of War in a circular issued on the 11th January, 1916, expressly recommend that no Alsatian or Lorraine soldier should be put in a position of trust.

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The Germans have announced that 30,000 Alsatians and Lorrainers have deserted from the ranks of the German Army during the War. On the other hand many young men from Alsace-Lorraine are to-day voluntarily serving in the ranks of the French Army. Knowing what is the fate that would overtake them if by chance they fell into the hands of the Germans, the French Government is wisely employing these young fellows with the troops in the French Colonies, in Algeria, in Morocco, etc. France is not likely to forget her debt of gratitude to these sons of the two lost provinces; their names will duly appear in the pages of the *Livre d'Or*.

It must not be thought that there are no renegades in Alsace-Lorraine. Unhappily, in these provinces as well as in all other parts of the world, there are some who have no thoughts outside those connected with their own careers and selfishly personal successes. The numbers of these renegades are, however, small, but a few of them have acted in an extremely harsh and tyrannical manner against their compatriots. Frenchmen will know how to deal with them, if ever they should become answerable to French law.

It has naturally always been difficult during a casual visit to Alsace-Lorraine to learn from the inhabitants which way their real sympathies incline. These people have learnt to be distrustful of their questioners. The reserve shown by the people of Alsace-Lorraine in relation to this matter has led even French publicists to declare that the attachment of France was not reciprocated in Alsace-Lorraine. But those who know how and where to look for the necessary indications concerning the true feeling of the people of these provinces will discover abundant evidence to prove that the affection of France is requited in equal measure. In the same way that no single Deputy would dare to urge in the French Chamber that France should give up her claim to regain Alsace-Lorraine from Germany, so also not a single inhabitant of Alsace-Lorraine would for a moment think of opposing the restitution of these provinces to France; if one were to do so he would be instantly stoned by his compatriots.

Should there be any who have doubt as to the loyalty of Alsace-Lorraine for France, they are reminded that, in 1912, at the time of the Zabern affair, von Jagow, the Prefect of Police in Berlin, wrote :—" The German officers quartered in Alsace-Lorraine feel that they are camping in an enemy's country." Again in 1914, when formations of the German Army entered Alsace-Lorraine on their way to the French frontier, the officers said to their men : " Hier sind wir im Feindesland " (We are now in enemy country).

The War has very completely altered the external appearances in many parts of Alsace-Lorraine. Timber and young trees have been ruthlessly cut down and many of the hilltops are now quite bare; military roads have been made to their summits. In many a stubble field the craters made by shells have filled with water and droves of cattle may be seen quenching their thirst at these drinking-fountains improvised by the forces of War. The song of the birds is now completely drowned by the music of the artillery of the contending troops. Barracks for men and standings for animals have sprung up like mushrooms in a well-spawned field. Ammunition dumps, tool dumps, ambulance

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depôts, communication trenches, defensive positions are met with in every direction in which one travels through these provinces. Military motor-cars rush at a terrific speed through the villages, regardless of the lives of the little ones who make the streets their playgrounds as of yore. Enormous supply wagons of the Mechanical Transport Service are driven at extraordinarily high speeds through inhabited regions making the whole countryside tremble as if an earthquake were taking place.

In spite of the increasingly heavy weight of the yoke under which the inhabitants of Alsace-Lorraine have been living during the past six and forty years, they have jealously maintained their independence in all that relates to the spiritual side of their existence; their genius is still of the French type.

In conclusion, Monsieur Hinzelin reviews Germany's attitude with regard to Alsace-Lorraine. He tells us that :—

(i.). *This is what Germany wishes the Alsatians and Lorrainers to think of her :—*

That nothing that these people do is unknown to her. They live, they breathe, and they speak alone because Mighty Germany permits them so to do.

(ii.). *This is what Germany wishes France to think of the Alsatians and Lorrainers :—*

The Alsatians and Lorrainers are *Boches*.

(iii.). *And finally, this is what Germany wishes the Alsatians and Lorrainers to think of France :—*

In the eyes of France, the Alsatians and Lorrainers are Germans. In consequence, France distrusts them, insults them and imprisons them. If the French soldiers should ever penetrate into the two provinces, they will lay it waste with fire and sword.

But the Alsatians and Lorrainers know Germany too well to be duped with any lies of this order. They know that France has given many outward and visible signs of her attachment for the sons and daughters of Alsace-Lorraine and that she has given the warmest of welcomes to those of them who ran to her for protection at the beginning of the War and to all those who have done so subsequently. They are well aware of all that is being done in the Department of the Loire for their compatriots, who have practically founded a colony for themselves in that region of France.

France will take care to see to it that neither Germany nor her agents shall mislead public opinion regarding the two provinces torn from her after the War of 1870-71; their restitution is one of the essential War aims of the conflict begun in 1914. These two provinces are French by race, by tradition, in their aspirations, French to the very marrow in their bones and French as long as the world shall last.

W. A. J. O'MEARA.

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# NOTICES OF MAGAZINES.

## REVUE MILITAIRE SUISSE.

*No. 6.—June, 1917.*

### THE CHIEFS OF THE BELGIAN GENERAL STAFF AND THE NEUTRALITY OF BELGIUM.

The original article is from the pen of Major W. Marsily, of the Belgian General Staff, and is accompanied by a sketch-map of Belgium. It is well known, says Major Marsily, with what audacious and persistent bad faith the Germans have exploited the famous Ducarne-Barnardiston documents as evidence in support of their allegation that, long before the outbreak of the Great War, Belgium had deliberately failed in her duty as a neutral, in that she had concluded a Secret Treaty of Alliance with Great Britain in 1906.

When the documents in question first fell into German hands at Brussels, the German authorities at once set about doctoring them. Apart from misrepresenting the word *conversation*, which appeared in the text of the original, as being the word *convention*, they with intent omitted to reproduce a marginal note, in the Belgian general's handwriting, the existence of which completely destroyed the German case. The note in question ran as follows :—" *British troops will only enter Belgium after our neutrality has been violated by Germany.*"

Taken *flagrante delicto* in their assault on the truth, the Germans, after waiting five months, with very bad grace, reluctantly admitted that they had misread the text of the document. They, however, obstinately persisted in the charges they had originally levelled against the Belgian Government of having, in agreement with the British Government, planned a combined military campaign against Germany.

Being obliged to withdraw this accusation, owing to the formal denials of the Belgian Government, supported as they were by irrefutable evidence, the Germans fell back on the argument that " the *Chiefs of the Belgian General Staff* had, in complicity, more or less dissimulated, with their Government, on two occasions at least—General Ducarne in 1906, General Jungbluth in 1911—prepared in conjunction with the British General Staff a plan of combined operations against the German Army."

The above is the latest form which the German accusation has taken. As late as the 20th February, 1917, the *Norddeutsche Allgemeine Zeitung* published this version of the charges made by the German military authorities and claimed to have adduced fresh evidence in support of their contention.

Not only the fact that no action was taken on the *conversations* between General Ducarne and Colonel Barnardiston in 1906, but also the fact that Colonel Bridges continued the *conversations* with General

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Jungbluth in 1911, goes to prove one thing and one thing alone, namely, that the relations of the two staffs were of a *strictly personal* nature and therefore the bottom is knocked out of the so-called evidence to which the Germans would wish the world to attach such great importance.

Since the Belgian General Staff was responsible for making arrangements to meet every probable contingency, in the event of a war, in which the employment of the Belgian Army might be involved, it was but natural that its members should take every opportunity of discussing problems affecting Home Defence with those qualified to speak on the subject. They would have been equally glad to have had the views of German or French Military Attachés as they were to have had those of the British Attachés.

The Germans claim to deduce from the conversations which took place the argument that the Belgian military authorities concentrated their attention on the study of the question of Home Defence, based exclusively on the hypothesis of a violation of the neutrality of their country by Germany, under the perfidious inspiration of Great Britain, and that the Belgian Staff had, in consequence, premeditated an alliance with the British Isles and France, going so far as to work out the details of a deliberate and preconceived combined aggressive action.

The absurdity of this accusation is clearly shown if trouble be taken to examine the dispositions decided upon for the preliminary mobilization of the Belgian Army (*vide R.E. Journal* for November, 1915). The centres chosen for this mobilization show that of the six Divisions of the Belgian Army, four were employed as outpost troops on *three fronts* viz. :—two covering Belgium against an advance from France, one covering the country against an advance from Germany, whilst the fourth was in a position to meet an attempted landing of British troops on the Belgian littoral.

Had Belgium really entered into an alliance with Great Britain and France, it is, to say the least, highly improbable that the Belgian General Staff would have disposed the bulk of their small field army on mobilization as they actually did dispose them, actually after the note despatched at 7 p.m. on the 2nd August, 1914, by Germany demanding a free passage for the German Armies had been received at Brussels, *i.e.*, at a time when the Belgian Government ought definitely to have known that two of the contingencies which these dispositions had been originally designed to meet no longer existed. The German allegations are further refuted by the attitude taken by King Albert with regard to the offer of assistance from the French Government. At the same time that His Majesty refused to comply with the German demand, he politely declined the military support tendered by France.

It was not till the night of the 3rd—4th August, 1914, when absolutely reliable information was obtained that the Germans intended marching through Belgium, that orders were given for the concentration of the Belgian Army on the Gette position, under the protection of the two Divisions at Liege and Namur. The fact too wants to be remembered that the Belgian Government actually waited till the 4th August before making an appeal for military support to the Powers that had guaranteed

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the neutrality of Belgium; this step was then only taken because at that time German troops had already marched on to Belgian soil. The hesitation of the Belgian Government in making their appeal for help involved the loss of precious time.

The impartiality of the Chiefs of the Belgian Army and their intention to defend their country against all aggressors alike, whoever they might be, is likewise evidenced by the nature of the Staff Rides carried out in the years immediately preceding the present War. An excellent article has been published on this subject under the title " Témoins de Moralité " in the *Écho Belge* for the 11th February, 1917, in which reference is made to the practical exercises carried out during the third and fourth years at the Belgian *École de Guerre* in connection with Staff Rides and in written theses. For some years the exercises set under both these heads had been framed on the supposition alternately, first that one, then that the other of her powerful neighbours, *i.e.*, France or Germany, had felt justified in violating the neutrality of Belgium. The balance was so evenly held that on the occasions when the Special Idea for the Staff Ride involved the problem of defence against a German Invasion, the written thesis required the appreciation of the situation in connection with an anticipated French Invasion. The future Staff officers of the Belgian Army were thus required to study constantly and successively the nature of military operations which the two armies, most likely to come into collision with their own army, were likely to undertake in the event of Belgium being involved in a war. It may be argued that the nature of the schemes set to the aspirants for Staff employ affords no relevant evidence regarding the alliances entered into by a nation. It must be admitted that strictly this view is correct. On the other, if the Chiefs of an army hold preconceived ideas on the subject of the *rôle* that their own army may be called upon to play in a war experience teaches that in time their views are sure to become widely known and will not fail to influence the character of schemes set by those subordinate to them. So far then the absence of any bias, as indicated above, tells in their favour, although of negative value as evidence. But evidence of positive value is to be obtained from an examination of the studies carried out by a General Staff in connection with Home Defence schemes, and the author of the *Revue* article, therefore, appeals to the record of what was done in this matter in Belgium in 1897 and subsequent years, as a basis on which to assess at a proper value the German accusations levelled against the Belgian General Staff. In the 17 years that preceded the outbreak of war, the Belgian General Staff carried out 14 such studies—for certain reasons no such studies were made in 1900, 1905 and 1915—under five different Chiefs of the General Staff. On *seven* occasions France was the supposed enemy of Belgium, on *six* this *rôle* was assigned to Germany, and on *one* occasion it was perfidious Albion which, with the complicity of France, was credited with the intention of invading Belgium. Strange as it may appear, it was General Ducarne, a man more suspect than any other in German eyes, who was responsible for framing the scheme in which Great Britain was assumed to be Belgium's enemy. He was responsible for four more out of the 14 schemes; on two occasions he assumed Germany would

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be the aggressor and on two occasions that France would play this *rôle*. General Jungbluth was only responsible for one scheme; and he indicated France as the supposed enemy. Short particulars of the several schemes are given in the *Revue* article; any unbiased person examining this record can come to one conclusion only, viz. :—the German charges against the Chiefs and General Staff of the Belgian Army are baseless and have been fabricated, by the wilful distortion of facts, for the purpose of taking away their characters in the eyes of the neutral world.

## THE GERMAN OPERATIONS IN THE WESTERN THEATRE OF WAR, 1914 TO 1917.

Colonel Feyler's article on the above subject, begun in the May number of the *Revue*, is concluded in the issue under notice (see *R.E. Journal* for September, 1917).

### 4. *Battle of Flanders.*

The events that now occurred on the part of the Front between Ypres and the sea were, says Colonel Feyler, the logical outcome of those preceding them and born of the same inspiration. It was again a counter-attack and one which had the same objective. In spite of the noise made in Germany with regard to the "March on Calais," the offensive in Flanders possesses the character, above all things, of an ultimate counter-offensive, delivered with the object of regaining the initiative by an envelopment of the enemy's outer flank.

To effect its purpose, the Great General Staff had formed a New Army, composed partially of Volunteer Corps, which had been rapidly expanded, but whose courage was not able to make up for its inexperience. It consisted of 14 Army Corps and 4 Cavalry Corps.

The first attack of the Volunteers was delivered along the sea. They advanced in serried masses, through which the artillery of the defence ploughed deep furrows producing hecatombs of dead. The German Higher Command persisted in their efforts to gain a victory, regardless of the losses being suffered. The whole thing recalled Napoleon's part at the Battle of Eylau. After ten days of attack and of immense casualties, the game had to be given up. Inundations came to the aid of the defenders; the survivors of the German legions were obliged to withdraw.

It was next around Ypres that the battle raged. The Franco-British troops now took the offensive; the fight continued from 21st October to the 16th November. The Allies, who had been obliged to give ground, were able on the 14th November to retake some of the lost positions. The battle then came to an end.

### *Comments on the Strategy.*

The *communiqués* and commentaries of the Great General Staff, it is pointed out, claim that the German manœuvre in Flanders was an independent operation, and something quite apart from the preceding events. The "March on Calais" was directed against Great Britain, the operations against France being represented as having been brought to a successful conclusion on the Aisne.

The whole thing is fantastic. In a military campaign one ought not, says Colonel Feyler, to make a series of capricious deer-like leaps, or to abandon one operation in hand for another wholly unconnected

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therewith. An examination of the succession of events discloses that in the Battle of Flanders we have what is the fourth phase of one and the same manœuvre; a manœuvre conducted for the purpose of enveloping the Allied Armies, which, however, continued to elude the Great General Staff to the end.

The first phase was the manœuvre on the Meuse. The Germans at that time possessed the initiative; they drove back their adversaries some 110 miles into the interior of France.

The second phase was the manœuvre on the Marne. The Anglo-French Armies now in their turn had the initiative and forced their enemy back some 50 miles towards Belgium.

The third phase is directly connected with the preceding one and is in continuation thereof, namely, the manœuvre on the Aisne and on the Somme. The Germans tried to regain the initiative; the Anglo-French endeavoured to retain theirs.

The manœuvre in Flanders was the fourth phase. The Germans, finding they could not regain the initiative, were in despair and tried a change; they moved some 60 miles further northwards, inclining westward at the same time Their intention remained as before, but their enemy refused to surrender the advantage gained and at the same time sought to profit by the existing circumstances to make good by means of a counter-manœuvre.

Shortly put:—The manœuvre on the Meuse was a German offensive which was broken by the Allies.

The manœuvre on the Marne was an Allied offensive which was broken by the Germans.

The manœuvres on the Aisne and in Flanders were conjointly an Allied offensive and a German defensive accompanied by a counter-offensive. The Great General Staff executed on a great scale that which it had attempted on a smaller scale at the beginning of the manœuvre on the Aisne. By withdrawing troops from the original German battle front, by liberating the German Army employed against Antwerp, by bringing up a New Army from Germany, a powerful *réserve de manœuvre* had been formed, which enabled the Kaiser's armies to overlap to their right the front they held on the Aisne and also to throw it forward.

### 5. *The Battle of Verdun.*

The Battle of Verdun has no direct strategical connection with the operations of 1914; the latter failed definitely on the fields of Flanders. The whole front between Switzerland and the sea being continuously occupied by troops, it was no longer possible to attempt to turn a flank, at least without violating the neutrality of Switzerland.

The German decision to launch an attack on Verdun was probably taken in view of the disappointing results obtained by the Austro-German Armies in Russia and in the Balkans in 1915. The territory won in the East did not obtain for the Central Powers that which the destruction of the enemy's forces would have procured for them; a peace on German terms. Russia had still large armies at her disposal and was not willing to treat for peace. Serbia and Montenegro, although completely invaded, were not seeking peace either. It would have been useless for the Austro-German Armies to advance further eastward so

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long as the Western Powers remained in a position to threaten the Germans with ever-increasing forces. There did not appear any other way out for obtaining the peace desired by the Central Powers than that they should once more try conclusions with their western foes.

The offensive against Verdun took the form of the *attaque brusquée*. Such an attack is in the nature of a manœuvre in which a very complete and very prompt decision is sought. By its means an attempt is made to obtain a defeat of the enemy in such a way that the surprise experienced in consequence causes him, so to speak, to lose his head; he is knocked down before he has time to think and is therefore ready to give in.

Four German Army Corps were selected for this operation and received special training over a period of some months. They were placed on a narrow front of some 7½ miles, and strongly supported by artillery. They attacked with ferocity and suddenness. The sector at Verdun chosen for this attack was particularly strong. The risks run by the Germans were serious, but the prestige which would have accrued had the attack succeeded would have been immense. Think of the effect that would have been produced on the world at large by the announcement: "Verdun captured after three days of heavy fighting!"

Before the attack the Kaiser came to show himself to the troops under the command of the Crown Prince, as he had done at Nancy, at Ypres. When the attack was first launched, the German newspapers announced that William II. had himself signed the order for the attack.

The nature of the operations, the choice of the sector chosen for the offensive, and the staging of the piece by the Higher Command—features repeated almost identically in the offensive in Roumania—appear to betray the purpose in view; it was a case of angling for a success the prestige of which would dazzle public opinion; the success hoped for would justify the offer of *generous peace terms*.

Other reasons have been put forward to explain why this battle was decided upon; it has been said that the capture of Verdun would release the Briey Basin and that it would at the same time prevent the French from launching an offensive from the neighbourhood of this fortress. Colonel Feyler is of opinion that the foregoing considerations may have entered into the German calculations in the selection of the sector attacked, but he feels that the real motives must be sought for in a more remote and in a deeper purpose. The German Government wished and hoped, he explains, to bring the War to a successful end at Verdun; a war which, in its own interest, in that of the German Empire and of German hegemony in Europe, and for dynastic reasons also, it was necessary to show had been successful in every field. In no quarter was the necessity greater for effacing the memory of the checks suffered by the German Army in the operations of 1914, in Russia and in the Balkans than in the West. If the attack on Verdun had been successful, it is more than probable that even at this period an offer of peace, which the nature of the victory of the Central Empires in Roumania alone had not been thought sufficiently to justify, would have been made. However the offensive of 1916, instead of neutralizing the failure of that of 1914, accentuated it. The frontal attacks and localized operations failed as completely as had done the wide turning movement of an earlier date.

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### 6. *The Battle of the Somme.*

The Battle of the Somme opened in the last days of June, 1916. During the whole of that month public attention had been rivetted on Verdun. Towards the end of June, after a period of calm, the struggle recommenced suddenly with great violence to the east of the Meuse, the fighting took place at Thiaumont and Fleury, in the second line of defences, whilst on the west bank of the river Hill 304 was the point contested for.

On the 1st July, Berlin announced to the public that much activity prevailed in the Somme region, but without indicating that the German arms had already suffered a reverse; no admission was made of the fact that the German trenches had been captured on a 15-mile front and that the defenders had been obliged to retire to their second line of defences. The Western Allies continued to make progress, capturing large numbers of prisoners. At no period since trench-warfare had been inaugurated had so rapid an advance on so wide a front taken place to so considerable a depth. At Verdun the Germans had spent five months in gaining the same extent of ground; at Arras and on the Champagne the French had suffered heavy casualties for the tactical successes won there. From the first the results obtained on the Somme were very different; the question was debated as to how these results would react on the operations then in progress round Verdun. And when the Allied forward movement towards Peronne, in the direction of the German communication on the Aisne began gradually to take place, the effect of this advance on the German Noyon front began to be discussed also. At first, no essential change in the attitude of the German Higher Command was noticeable. To the north of the Somme, after their first rush forward, the British troops, forming the left wing of the attacking forces, were brought to a halt, and the French troops, forming the right wing, marked time astride the river, waiting for the British to come up level with them. The Berlin *communiqués* affected to treat the situation with contempt; for all that could be learnt therefrom, the Battle of the Somme had no existence in fact.

But by degrees information filtered through. Mention was made of the transfer of three divisions from Verdun to the Somme. On the front engaged the sector reserves had come under fire; scratch battalions had been formed by the grouping of companies in various localities, etc. The situation on the Somme was indeed far more serious than Berlin has ever admitted. Indeed, on the 13th July, the great attacks on Verdun were brought to an end by it. It was now the turn of the French to counter-attack; they retook the works at Thiaumont and Fleury on the 5th August; Douamont Fort on the 25th October; Vaux Fort on the 2nd November; finally, reaching the region north of the line whence the German *attaque brusquée* was launched on the 21st February, the French reached Vacherauville and Louvemont, at the same time, capturing 115 guns and 7,500 prisoners; including the prisoners taken on the day that Douamont Fort was captured, this made the total 12,000 officers and other ranks.

Thus the Battle of the Somme extinguished the German offensive at Verdun.

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The Franco-British attacks on the Somme followed their course. At the end of July the French and British troops had made about equal progress, the former towards Peronne, the latter towards Bapaume; at the end of August, they were both nearing Combles, a *centre de resistance* between the two towns named. Powerful *pushes* were made successively along different sectors of the front engaged, sometimes in the north, at others in the south, and at times in the centre, all directed towards the gradual envelopment of the great fortified maze. Once Combles was reached, the British pushed towards Bapaume *viâ* Sailly Saillisel and the French made their way towards Peronne *viâ* Bouchavesnes. Whilst directing their operations against Sailly Saillisel the British made a *push* against Thiepval and the Valley of the Ancre, and ultimately a *push* to the north of the Ancre, *viâ* Puisieux and Achiet, with the object of gaining the German trench system at Bapaume *viâ* the north. The French operated against Chaulnes for the purpose of reaching Peronne *viâ* the south.

Combles fell to the Allies at the end of September. During the three months that fighting was in progress in this region and in the successive retreats of the Kaiser's troops, 60,000 German soldiers were made prisoners. At the end of October, the *push* towards Peronne *viâ* the north carried the Allies beyond Bouchavesnes; the British had also reached the banks of the Ancre, north of Thiepval and Courlelette; the number of German prisoners rose to 70,000. At the end of November, whilst the French were threatening Chaulnes at close quarters, the British, having extended their attacks to their left penetrated into the plateau on the north bank of the Ancre and captured 4,000 prisoners. The situation was thus prepared for the next spring campaign.

When activity broke out afresh, in February, 1917, the British obtained more successes; their artillery bombardments reached extreme intensity and made the enemy's trenches untenable. At the end of this month Bapaume was hemmed in from the north, west and south; the St. Pierre Vaast Wood, between Saillisel and Bouchavesnes, had been occupied by them; the envelopment of Peronne was approaching completion.

The situation had become too uncomfortable for the Germans; they began to retire. The Noyon arc collapsed on to its chord and the Germans betook themselves to positions on the line Arras-St. Quentin-Laon-Soissons. The second purpose of the Battle of the Somme was attained; not only had the German offensive against Verdun been extinguished, but the west wing of the German front on the Aisne had been obliged to give way.

*Comments on the Strategy.*

The Battle of the Somme was the cause, or one of the causes, of the German retreat in March, 1917. But other reasons existed for the step taken; a recapitulation of them may prove instructive.

Strategy possesses some of the qualities of Nature herself; it abhors a vacuum and its course does not consist in discontinuous steps; strategical operations are like a sound chain of which each of the links is perfectly welded: each link regularly follows the motion imparted to the chain as a whole, so in war the sequence of operations

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are dictated by that act of war which modifies an existing situation; this situation alters continuously as each subsequent act makes its force felt.

To-day when the German retrograde movement has involved the withdrawal of a part of the troops on the front to which the duty had, in 1914, been assigned, by the Great General Staff, of enveloping the Allied forces on the Aisne; to-day when the disappearance of the Noyon Salient removes one of the most pointed indications of the march projected on Paris, one is tempted to reconstruct the chain of events by which the offensive of 1914 is linked up with the retreat of 1917, to seek out the moment when the question of retreat was first brought under discussion and the moment when the situation became such that this movement could no longer be postponed. Colonel Feyler traces the necessity for the retreat of March, 1917, to the date of the check of the Germanic offensive in Poland. Since the Russian Army had not been completely put out of action in 1915, a campaign in the East had to be undertaken in 1916. But the French Army had suffered, if anything, less discomfiture than the Russians, and in the meantime, the British New Army was rapidly growing more and more in size and in efficiency. Since the date of the second Battle of the Champagne, in the autumn of 1915, the Germans had had to bring back to the Western front the troops transferred to Galicia in the preceding spring. The Austro-German Army, even though augmented by the Bulgar Divisions, was weakened by the troops sent to the Italo-Austrian theatre, and, in consequence, was not in a position actively to wage war simultaneously in the Eastern as well as in the Western theatre of operations. If peace could not be secured forthwith, it became imperative that German troops should be withdrawn from one or other of the two main fronts. This indicates the approximate date when the question of a retreat must first have been discussed.

Peace, the Germans fully realized, could alone be secured by striking the Allies in the West a blow of such violence as to knock them out of the ring. Thus was born the idea of the attack on Verdun. Russia, it was felt, would require a long time in which to get her breath and be ready for the next round; this would give the Great General Staff sufficient time to attend to other business.

The Germans were unable to pull off the event; the *succès brusqué* failed them. The moment the affair began to drag, it became necessary to think of cutting losses. Thoughts were turned to a peace, in which bargaining would have to take the place of a peremptory dictation of the clauses which, had events taken a different turn, the Kaiser's plenipotentiaries had no doubt intended to insert into the agreement for the purchase of a German peace.

Once more, the Russians had recovered and returned to the charge sooner than had been expected, and as, in the meanwhile, the German troops were committed on the Somme, it became necessary to devise means to prevent General Broussiloff gaining a great victory The Turks were made use of, and Falkenhayn's Army came into existence. The Germans now fell back on the defensive along the whole of the Western front. The attack on Verdun was broken off and preparations were made for an obstinate resistance on the Somme.

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Colonel Feyler sums up the six great phases of the operations of 1914—1916 on the Western Theatre as follows :—

In 1914, the general offensive of the Germans did not meet with success ; in spite of the great resources at their disposal, which were utilized to the fullest extent, and the power of manœuvre possessed by the wings of the invading force neither were the Allied Armies not destroyed, nor were they deprived of the power to continue the struggle. The respite the Western Allies obtained in 1916, whilst Germany was seeking a decision in the East, gave them breathing space in which to gain strength for the continuance of the contest.

In 1916, the regional offensive undertaken by an Army, specially organized and trained, did not come up to German expectations. This Army suffered greater wastage than it inflicted on its opponent. This is evidenced by the fact that the Franco-British replied with a counter-offensive against Verdun. The counter-offensive put an end to the Verdun Battle, where the French were able partially to regain their old positions ; although, on the Somme, the Germans were not able to re-establish themselves in their old defences and had to retire without obtaining any counter benefits.

The peace offer made after the Roumanian campaign, in which the Great General Staff had made use of the New Reserve Army organized in 1916, had its origin in the peculiarly unfavourable position in which Germany found herself, owing to the setback her arms had experienced in the Western Theatre.

If the Great General Staff did not consider it possible to undertake an offensive in the spring of 1917, with the help of the Reserves built up during the preceding winter, this must have been due to :—

(*a*). A conviction that it was not possible to attain results with such Reserves which neither the Old German Army of 1914, nor the Specially Trained Army of 1916 had been able to secure.

(*b*). The impossibility of at once making good the wastage caused by the Allied counter-offensive on the Somme.

It may be said that the feature in the opening stages of the fourth campaign of the Great European War which most impresses is the tacit admission by the Great General Staff of the superiority of their enemy, a superiority which prevented them from imposing their will under conditions similar to that in which the conflict was begun ; for this reason the Germans were obliged to surrender advantages gained in the early days of the War, in the hope that by doing so they might obtain successes which might prove relatively more profitable to their cause.

### THE ITALO-AUSTRIAN THEATRE OF OPERATIONS.

The article on the above subject begun in the number of the *Revue* for April, 1917 (see *R.E. Journal* for August, 1917) is continued in the issue under notice. The text is accompanied by a sketch map showing the Austrian trench system in the Monté Pasubio zone, and three photographic views of a part of the Alps in which Italian and Austrian troops are struggling for the mastery.

The operations in progress in the Alps during the autumn of 1916 consisted of a series of tactical enterprises undertaken by considerable numbers on the two sides.

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The Pasubio, situated S.W. of Rovereto, is bordered on its west by the Arsa Valley ; the region is one of stiff slopes, its main features being the Monte Spil, in the west ; the Monte Testo in the centre ; and the Monte Pasubio in the east. The Austrians had strongly fortified the three heights in question and had also occupied the Corno in advance of the western sector, whence they were able to take in flank the lines of approach towards the Monte Spil ; from the Corno they could launch a counter-attack with considerable prospect of success. The character of the ground was such that only small numbers of troops were required to hold the Austrian trenches. On the slopes east of the Foxi Valley—a valley descending from the Monte Testo to the Arsa Valley—the Austrians had constructed a line of defences with a strong point near the summit of Monte Pasubio ; 1,000 yards in rear of this point a second line of defences had been constructed along the Ruite Buse di Bisorte. The wire entanglements provided in front of this trench system was in places 50 yards wide and at a great many points covered approaches to the fire trenches had been cut out in solid rock.

A brief outline of the principles of mountain warfare is given in the original article ; the Austrians, it is stated, correctly applied these principles in the defensive measures adopted by them in the Monte Pasubio zone.

Although the Alps provide a formidable defensive rampart to the countries they cover, still it is possible for an enemy to penetrate them, if such an enemy possesses sufficient determination.

The very best of positions in the Alps, however, are of little or no value without approaches thereto and without shelters for the troops. In the provision of these the Italians have done an enormous amount of work. The roads they have constructed, the telfer lines they have run across this mountain region, and the shelters they have provided have enabled their troops to occupy and hold on to positions in regions formerly reputed to be inaccessible. They have fully realized that in connection with operations in mountainous countries defence works are of secondary importance, but that a well-laid-out system of communications and ample shelter accommodation are prime necessities.

A short account is given in the original article of the operations of the 44th Italian Division which had the task assigned to it of capturing the Pasubio ; its first objective was the Alpe Cosmagnon. The mastery of this particular region gives its possessor a dominating position and access, under the best conditions, to the Pasubio Plateau. The fight for these positions began on the 9th October, 1916 ; at the outset, the Italians succeeded in driving the Austrians out of a part of their positions between M. Pasubio and Lora and in maintaining their gains for several days, in spite of violent counter-attacks. On the 27th *idem*, after having consolidated the positions won from the Austrians, the Italians renewed their attacks against the Dente di Pasubio. The Austrians now launched a heavy counter-attack, the issue remained in doubt for a little time, success and failure alternated ; finally the Austrians were able to render the Dente untenable by the Italians, who had to withdraw. Bad weather now set in and put a stop to further operations.

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The activity in other Alpine sectors and in the Dolomites was equal to that on the remaining portions of the Italian frontier; however, it had but a very small influence on the general trend of the operations. It was on the Carso and in the neighbourhood of Gorizia that a decisive issue was being fought for by the belligerents.

The Italian positions on the latter front have been described in an earlier part of this article. The first Italian attacks on the Carso front were delivered in the middle of September, 1916. The XI. Italian Army was employed in this region and succeeded in penetrating into the Austrian defences between and in the neighbourhood of Pecinka and Oppacchiasella. In a few days' fighting the Italians took 4,104 Austrians prisoners, including 101 officers and a large quantity of valuable stores.

On the 10th October, the offensive was resumed by the II. Italian Army to the eastward of Gorizia and by the III. Italian Army on the Carso. Two days later the Italians had reached the slopes near Pecinka and were about half-way on the road connecting Oppacchiasella and Kostanjevica. Some idea may be gained of the importance of this action from the fact that the Italians captured 8,219 prisoners, including 254 officers. Towards the end of the month further inroads were made into the Austrian defence positions; the III. Italian Army carried the Pecinka positions and pushed forward as far as the western borders of Kostanjevica, the total number of prisoners taken having increased to 8,982, including 259 officers.

The author of the original article states that he has purposely refrained from discussing the operations in which the Italians took part in 1915. The battles on the Isonzo, he remarks, were trying, long-drawn-out and sanguinary. The results obtained were not commensurate with the effort expended on them. It is suggested that some who have written on the subject of the Isonzo campaign (in the summer of 1915) have come to erroneous conclusions. They have not given sufficient consideration to the question of the topography of the theatre nor to the state of disorganization in which the Italian Army was at the beginning of 1915. Italy had first to develop her military power before she could be capable of a continuous effort, hence the disjointed nature of the operations in 1915. In 1916, the Italians were able to contain the Austrian offensive in the Trentino and to make a thrust simultaneously elsewhere; and this provides evidence that they were in the ascendancy, in spite of the fact that their enemy was able at times to act on the offensive also. At the same time, it is admitted that the Austrians, in having employed small numbers of troops to hold their defences, whilst maintaining ample reserves in hand, undoubtedly acted on correct tactical principles.—(*To be continued*).

## NOTES AND NEWS.

*Switzerland.*—One of the regular contributors to the *Revue* writes that the Swiss Army recently experienced a somewhat disagreeable surprise in the industrial town of Chaux-de-Fonds, a Neuchatel Regiment billeted in this town having come in for hostile demonstrations from an anti-militarist clique. The demobilization of this regiment was effected in due course without any further unpleasant incidents. A few days later, however, an *émeute*, amounting almost to a revolution,

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broke out in Chaux-de-Fonds and had to be put down by the military. Blame is thrown on personages in high quarters for the existence of a situation involving such an outbreak; at the same time, it is stated, that it would be a mistake to attach too great significance to the incidents in question.

A reference is made to a discussion in the Great Council of Berne on the subject of the exacting treatment experienced by the 3rd Swiss Division; it has been alleged in the Great Council that the Division has had to make excessively long route marches, and that proper arrangements have not been made in connection with the billeting accommodation provided for it. Resentment is shown in the Press at this interference in military matters by a civic authority. The Canton of Berne, it is pointed out, is the only one that has been accorded the privilege of providing a complete Division for the Swiss Army. There appear to be grounds for fearing that the friction between the Bernese Government and the Command of the 3rd Division is likely to continue, much to the detriment of the Division. The contributor of the original notes hints at the remedy which should be applied to put an end to this conflict between the civil and military authorities.

It is announced that the Federal Council have accepted the resignation of his Staff appointment by Major Bircher. Major Bircher has come much into prominence recently, having been accused of a want of tact; the Swiss Press do not appear to be altogether satisfied with the manner in which the Federal Council have handled his case.

*Belgium.*—A special correspondent points out that one of the very interesting aspects of the present War lies in the greater and greater *industrialization of war*. That is to say, war has become an extremely vast undertaking, with many branch establishments which continue to increase in numbers day by day. In former times a few industrial institutions of the country, in addition to the Government arsenals, provided all the stores, supplies, etc., necessary for the maintenance and sustenance of armies in the field. To-day, the demands of the War Department have become so exacting that the Department has been obliged to become its own contractor, its own manufacturer in respect of all articles of which the consumption is very great. This is particularly so in the case of Belgium. An immense industrial establishment has been erected for the repair and cleaning of soldiers' soiled, damaged or partially worn-out garments of all sorts. The operations carried out there are conducted on commercial lines; nothing is allowed to go to waste. Uniforms which have been turned in there in tatters, covered with mud, stained with blood, etc., are turned out again in perfect order, clean, dry, disinfected and complete in every detail. A single far-seeing energetic officer has general supervision of the establishment and is assisted by a number of N.C.O.'s who are experts in the jobs overlooked by them.

In another domain, widely different from the foregoing, evidences exist of the same industrial spirit which is boldly renovating the Belgian Army. It is well known how very important a *rôle* has been, and is being played, by trench artillery since the day that the war of movements came to an end and relative immobility of opposing fronts has been the order of the day. The Belgian Army has borne its full share in invent-

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ing, designing and perfecting the various types of trench guns, trench implements, etc , which form so large a part of the equipment of the trenches in France and Flanders. The Belgian Army continues to play its part on the Yser-Yperlee front, and Belgian aviators have been particularly active in co-operating with British and French airmen in the attacks on the German naval establishments at Ostend and Zeebrugge.

A note of regret is sounded at the lack of interest shown by the public in the doings of the Belgian troops in the Congo. The successes obtained by General Tombeur in his campaign against the Germans is briefly touched upon. This expedition was prepared and organized very methodically and with great care. The black troops have done exceedingly well. Science has been put under liberal contribution, so that in the Tanganyika region battles have been fought comparable in their nature, from the technical standpoint, with those which have been witnessed on the Yser, though naturally falling far short in magnitude in comparison with the contests in Flanders.

The British and Belgian African campaigns are interesting by reason of the results attained ; these campaigns have destroyed at a single blow the possibility of the German dreams in the equatorial regions of Africa ever maturing.

*United States of America.*—A special correspondent draws attention to contemporaneous events in the Old World ; he feels that in view of the rapidity with which the situation is developing his news will be very stale by the time it is in print, owing to the delays in the post.

At the time of writing the cry for universal service had many supporters in the United States of America ; Mr. Baker, the War Minister, who had been opposed to it, had recently been won over to the cause. The actual position of affairs with regard to the American Army, when the original notes were written, was as follows :—

(*a*). *Regular Army*. The enrolled strength had not reached the establishment authorized by the Law of 1916.

(*b*). *The Militia* had an enrolled strength of 129,000 men ; some 75,000 of these troops had recently returned from the frontier, along the Rio Grande, after from six to eight months' duty there and to this extent they were in a better state of training than was any part of the Militia on the eve of the Spanish War in 1898.

(*c*). The *Reserves* of the Regular Army and of the Militia had not started getting ready for war.

The Central Government and the Federal Authorities did not wait for the declaration of war before taking action in relation to the millions of people belonging to the German race settled in the United States. Among other steps taken was the remobilization of a number of infantry and cavalry regiments, which were demobilized on return from the Mexican frontier ; these regiments find the necessary guards for the protection of the ammunition factories, railways, etc., against which Teuton conspirators may have designs.

The municipalities also have not remained inactive ; wherever large numbers of munition factories exist and a strong German element is present, the City Fathers have raised *Home Guards*, on the Canadian model.

Before the declaration of war against Germany, the American General

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Staff had prepared a scheme for raising an army of four million men; one and a-half million men were to be enlisted and trained forthwith; one and a-half millions three months later; and one million were to be retained as a reserve to be organized into units at a subsequent date. According to official statistics the numbers that the United States Army could have put into the field at the date of the declaration of war against Germany amounted to 517,868 men. A doubt is expressed as to the probability of the United States raising an army of five millions, in addition to the men required for her fleet, within a reasonable time. As there is opposition to universal service on the part of some Congressmen, it has been proposed that double pay should be offered with a view to attract recruits; this would mean raising the pay of a private from £3 3s. to £6 6s. per mensem. The question is, however, one fraught with many difficulties of an economic and social order. The universities and colleges have taken in hand the matter of organizing courses of instruction for candidates aspiring to commissions. This instruction is on lines similar to that adopted by the McGill University, Montreal. Further, a school of instruction for cadets has been formed at Governor's Island, New York, and 1,500 young men are already receiving instruction thereat.

## INFORMATION.

### *Switzerland.*

*In the Cavalry.*—A short note is contributed under this heading, which deals with the measures adopted for *modernizing* the Swiss Cavalry, in accordance with the lessons of the present War.

*Major Bircher's Case.*—The disciplinary aspect of Major Bircher's case is reviewed, and the opinion is expressed that the method in which the case has been handled shows that there is an absence of the necessary firmness at the head of the Army. It is urged that, in the interests of the Army, an officer possessing serious faults of temper should be so dealt with as to prevent him from doing further harm.

The number of the *Revue* under notice concludes with bibliographical notes on works of military interest.

## SUPPLEMENT.

With the number of the *Revue* for June, 1917, is issued the last part of the *Supplement* entitled *L'Occupation des Frontières par les Troupes Suisse en* 1870—1871 by Colonel Galiffe (*vide R.E. Journal* for June, 1917).

This instalment consists of the Third Part of the Volume and deals with the Swiss Army.

Chapter I. deals with the troops. It is stated that the Swiss obeyed the call to arms with alacrity and carried out their patriotic duties in a most satisfactory manner, in spite of the climatic and other difficulties which had to be contended with during part of the time they were mobilized. Acts of indiscipline of a serious nature were exceedingly few, and only on rare occasions was it found necessary to arraign offenders before the military tribunals.

Although in matters connected with the moral and physical qualities of the troops all was as it should be, yet the reports on their fighting effi-

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ciency were in certain cases adverse, largely due to the insufficiency of their training under normal conditions. It was as regards the infantry that most fault was found; there were, however, great differences, it is stated, in the contingents furnished by the several Cantons. The engineers and artillery came in for the highest praise.

Great defects in the armament and equipment of the troops were also brought to light. These were cured, owing to the remedial measures adopted by the Military Department and the strictness of the control established.

Chapter II. deals with the mobilization and the transport. Three days after the orders were sent out for the mobilization, the five Divisions called out, with the exception of a Ticinese Brigade, were at the disposal of the Federal Government; two days later they were in occupation of the positions assigned to them. The credit for this is primarily due to the Cantonal authorities. The railways also had an important part to play, particularly during the latter part of the period during which the Swiss Army was mobilized, and performed the duties imposed upon them with considerable success.

Chapter III. is devoted to questions affecting general organization and command. The Government merely placed the various units composing the Swiss Army at the disposal of the Commander-in-Chief and the Divisional Commanders, but properly speaking nothing in the nature of an organized force existed. The military authorities had therefore to work out, with the assistance of the Federal Authorities, a military organization suitable to the situation. The obligations devolving on the several parties were often ill-defined and this frequently led to conflicts, which did not help matters forward.

All the auxiliary services, *e.g.*, medical, transport, etc., had to be started *ab initio;* and several days elapsed before the Swiss Army was in a really fit condition to take the field. In order that the various problems of command and administration should be expeditiously dealt with a staff organization had to be provided to relieve the Headquarter Staff at Berne of detail work. Criticism is made concerning the absence of *contact and of liaison* between the Divisions and Brigades; there appears to have been too great a tendency on the part of the Commander-in-Chief to deal directly with Brigades, and to ignore the Divisional Headquarters.

Chapter IV. is devoted to the Sanitary Services; it is divided into two parts.

The first part deals with the Medical Services. The regimental system was in vogue, medical officers being attached to the units; however, in addition thereto each Brigade had a Field Hospital attached to it.

A good deal of sickness prevailed in the early days of the mobilization, an epidemic of typhus carrying off a large number of victims. There were 9,610 cases of sickness in a force of 37,500 men, involving medical treatment for a total of 17,825 days; sore feet represented 22·9 per cent. of the cases treated. The second part deals with the veterinary services. Veterinary Hospitals were established at Morgenthal, Zurich, Nidau and Berne. During the first period of mobilization the wastage in horse flesh was relatively heavy; no information is available with regard to

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the second and third periods, but the money value of animals lost has been put on record as £7,160.

Chapter V. deals with the Commissariat.

No provision had been made by the Confederation in connection with supplies for a war, so that everything had to be improvised. In view of the urgency of the situation it was not possible to arrange for competitive tenders to be invited and, in consequence, high prices had to be paid for all the purchases made. At first troops were billeted, with subsistence, on the population or on the communes. It was not till the 27th July, 1870, that the Commissariat Department was able to commence issuing supplies.

A main supply depôt was provided for each Division—W.E. 8,400 men and 800 horses—containing rations for one month; and at the same time, an advanced depôt, containing rations for eight days, was also provided for each Division. These depôts were supplied from Central Supply Depôts, in which 100 days' rations were stored for 50,000 men and 6,000 horses.

At the time that the French Army of the East entered Switzerland, the Swiss Commissariat Department was able to send 200,000 bread rations from Berne to Neuchatel, which arrived at the latter place on the 1st February.

The total expenses in connection with the mobilization of the Swiss Army, which lasted from July, 1870, to March, 1871, was £400,000; of this sum £100,000 represented pay, £252,000 the cost of rations, and £24,000 the price paid for horses. To meet this expenditure the Federal Government raised a loan of £600,000 at 4½ per cent. per annum.

*Conclusion.*

Finally, Colonel Galiffe justifies the decision arrived at by the Federal Council, in July, 1870, to mobilize a part of the Swiss Army. He says that perhaps to-day, with the full information regarding events in one's possession, it may seem that too exaggerated a view was taken of the situation and that too large a number of troops were mobilized and that they were kept under arms too long. However, it must be remembered that the Federal Council, at the time that the measures described were adopted, were not aware of the zones in which the belligerents were concentrating, nor could they foresee what their intentions were. It had not been realized that France was so unprepared that she would be unable to resist Germany; further, the trend of political events had been such as to make it appear by no means improbable that Austria and Italy might intervene in the quarrel. The Federal Council could not very well run the risk of putting off defensive measures until Swiss territory had been violated.

The neutrality of Switzerland had, it was true, been guaranteed in 1815, but even in 1870 there was much evidence to show that diplomatic guarantees were after all platonic. Those responsible for the honour of the Helvetic Republic wished to make it clear that they did not consider Swiss neutrality to be some meaningless term; on the contrary, it was to them something real which they had the means to fight for and, indeed, to do so without external assistance.

The unanimity with which the Chambers, the Cantons and the citizens

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expressed their approbation of the steps taken is the best answer that can be given to those who argue that the Federal Council acted hastily and took too exaggerated a view of the possible danger to Switzerland.

On the other hand, the Federal Council is blamed for not providing the reinforcements asked for in January, 1871. Swiss officers, who had come into contact with the Chiefs of the French Army of the East, had formed the decisive opinion that the latter would not have hesitated to make use of Federal territory, even if it meant coming into collision with Swiss troops.

It is felt that the energetic action taken by the Swiss authorities and the scrupulous care with which the nation performed its duty as a Neutral enormously raised the prestige of Switzerland in Europe.

The brochure is provided with three appendices, viz. :—

App. I.—The General Staff of the Federal Army.

App. II.—Order of battle of the troops mobilized.

App. III.—The Convention of Verrières.

Eight sketch maps are provided which show the following situations :—

Map 1.—Zone of concentration and first deployment of the Federal Army.

Map 2.—Situation of Federal, German and French Armies on the 17th January, 1871.

Map 3.—Billeting areas of Federal Army on 29th January, 1871.

Map 4.—Billeting areas of Federal Army on 30th January, 1871.

Map 5.—Situation of Federal, German and French Armies on the evening of 31st January, 1871.

Map 6.—Billeting areas on 1st February, 1871.

Map 7.—Billeting areas on 2nd February, 1871.

Map 8.—Billeting areas on 6th February, 1871.

Map 9.—Billeting areas on 13th February, 1871.

Map 10.—Headquarters of Administrative and Medical establishments of Federal Army, July and August, 1870.

W. A. J. O'MEARA.

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*RIVISTA DI ARTIGLIERIA E GENIO.*

*April, May, June*, 1917.

ITALIAN MILITARY OPERATIONS FROM DECEMBER, 1916, TO MARCH, 1917.

*The Second Winter Campaign.*

*Snow and Avalanches.*—The experience of the preceding winter campaign had furnished to the Italian Army many precious lessons which tended to facilitate the organization and the conduct of the War during the second winter. But such advantages were largely discounted by the greater inherent difficulties owing to the increase in the masses of the said army, and the more complex organization, and especially by the greater severity of the climate. The number of days in which snow fell was about 50, equal to the normal annual fall for the Alpine zone ; the depth of the snow in many cases reached to 5 metres, in others over

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10 ;. the temperature, persistently low, in some mountain zones of high elevation fell to 28 degrees below zero. The immediate and grave consequences of such exceptional meteorological changes was the fall of many extensive and ruinous avalanches of which there were memorable and sad instances on the 15th December, 1916, and the 10th and 16th January, 1917. For example on the 13th December not less than 105 avalanches were signalled; in one of these at *Cauriol* there slid down more than 2 million cubic metres of snow; about 2½ millions in another avalanche in the Osanna Valley (M. Baldo), and not less than 6 millions in the valley of Costeana.

Fortunately the complete studies of the meteorological office at Headquarters had been able to ascertain a direct correlation between a special isobaric situation in Western Europe and the Mediterranean, and the intensification of the avalanches on the Alps. It became possible to establish a service of urgent telegraphic warning to the troops, which together with repeated instructions for precautions to be taken against the danger of avalanches contributed not a little to lessen the consequences of these ruinous phenomena. The Italian Alpine Club, also, with its vast experience gave valuable demonstrations for making commonly known the importance of precautionary measures.

*The Defensive System on the Theatre of Operations.*

The first necessity imposed on the attention of the Supreme Command and the Military Authorities for the winter season was the development of a complete systematic defence along the whole of the frontier and especially in the southern tract of the front Giulia, where by effective advances the Italian lines were pushed forward into the enemy's territory. A strong systematized defence had effected a considerable diminution in the guards of the first line, and had reduced the number of troops exposed to the rigours of the climate and the hardships of life in the trenches.

The critical points of the defensive organization were the making a first line as mobile as possible with the object of succeeding by means of sudden attacks in improving the extension of the Italian trenches and maintaining an aggressive spirit among the troops; successive lines of trenches radiating from the main trenches and redoubts, and constituting in their complexity a complete barrier, securely fortified against the enemy's attacks, and as a solid base for the setting out of a further offensive; systematizing bombardments by masses of artillery and by adapting positions for observatories, etc., for a well co-ordinated and efficacious fire; and finally a convenient network of communications that would allow of free circulation between the lines with relative security.

It is easy to imagine the enormous mass of work imposed by such an organization especially in a mountainous country composed of naked rocks which had to be mastered by the help of machinery. Nor was the work of construction wanting, as the abundance of snow which filled the trenches, burying the lines of barbed wire, imposed an incessant work of clearing, besides the rectification of portions of the front in order to escape the insidiousness of the avalanches. For this heavy work, in addition to the combatant troops, there were many hundreds of work-

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men less innured to the fatigues of war, detachments of territorial militia and squadrons of town labourers all enduring the inclemency of the weather, and the danger of the enemy's fire, and resisting fatigue with the calmness and good humour characteristic of Italian workmen.

In addition to the problem of the systematized defence of the front was the question of shelter for the troops, an arduous and vast problem, considering the rigours of the winter season, and the increase in the mass of the armies with limited encamping spaces in these Alpine regions. Convenient and secure shelters had to be provided directly from the front towards the rear, and a regular rotation of units had to be arranged so that all should enjoy equal periods of rest. The trenches, generally concealed so as not to offer easy targets to the enemy's artillery, had to be provided with shelters against the intemperate weather and as far as possible free from damp. Further to the rear, shelters for warmth were arranged for in places either natural or excavated in the rocks. The reserves were lodged in huts of wood and cement, not exposed to the fire of the enemy's artillery and providing greater resources. For the resting troops, camps were utilized, real village barracks well heated and lighted by electricity with beds of wood and iron, lavatories, baths, and establishments for disinfecting garments, stations for firemen, etc. Where it was thought necessary, on account of the rigid temperature, the huts were constructed with double walls and protected by strong beams from the danger of avalanches, the roofs following the slopes of the mountains so as to facilitate the sliding of the snow.

The construction of an immense number of shelters necessitated vast provision for the production of the material required. This was obtained by means of an extensive organization of an industrial character for utilizing the local resources, and purchasing materials from the most convenient markets. There were also provided the plant for furnaces, cement works, laboratories, and offices of various kinds, partly worked by electricity. The *personnel* for these establishments was by preference drawn from soldiers incapacitated from the fatigues of war and skilled in the various works.

The work of constructing the barracks alone required 300,000 cubic metres of wood, and 20,000 tons of various metal materials. Beds of iron and wood were constructed for about 1,000,000 men, 20,000 stoves, tarred boards, felt, zinc plates, etc.

*The Transport Service.*

The immense work of providing such materials for the life and welfare of the troops would have been impossible without a vast organization for the means of transport.

To commence with the railway services; this, although it underwent diminution during the winter, acquired a greater activity than it had ever done since the commencement of the War. Altogether in the period of time under consideration, about 34,000 military trains were run on the Venetian lines, besides the passenger trains and those for goods for the public. The transport of firewood, of wood for building, of munitions, and of animals alone employed 110,000 railway trucks. The sending of troops on leave required the continuous use of 2,000 carriages in each week, and in addition 1 million men were sent on

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leave to their families for short periods, and transported back to the War zone, and the crisis of coal told even more severely on the transport. The active development of the railway organization made it necessary to construct some hundreds of kilometres of new lines, the enlargement and construction of several stations, and the provision of immense quantities of wood.

The organization of means of transport by water, together with the widening and deepening of the channels of the canals that intersect the Venetian plains, and making them navigable for barges carrying 600 tons, was also intensified. New canals were constructed with a view to developing and completing the navigation between the Po, the Adige and the lagoons of the Isonzo. Finally, the improvement for the navigation of certain rivers, and the communication between the railway stations and these waters was established. Great attention was given to the transport by means of the Decauville railways, completing a network of some hundreds of kilometres with trunk lines in contact with the troops. For this network, for one army alone, these circulated normally 38 locomotives and 1,400 wagons, which in a few months transported 144,000 tons of material.

The employment of autocars was also widely spread, for preventing the freezing of the water in the radiators. The greater losses to which these means of transport were subject in the winter rendered necessary a system of new offices, and laboratories for repairs, etc. For transport not of an urgent character, animal traction was used, served by numerous squadrons of auxiliary military trains assigned to each army. Where the conditions of the roads and the encumbrance of the snow did not allow of transport by wagons, sledges were adopted with success, these being of a large type, drawn by animals carrying three quintalis and a smaller type drawn by hand for small loads.

The most secure and rapid means of transport in the mountainous zones traversed by fluvial obstacles, however, were the wire conductors adopted on a large scale which conveyed large quantities of material to the troops where the snow had created obstacles to the progress of reinforcements. Finally there was the great assistance given to the ordinary transport in high mountains by means of war dogs trained in pairs and not affected by the cold, sometimes even in storms drawing a sledge with a load of 70 or 80 kilogrammes. An immense transport movement cannot be possible without a network of roads which no mountainous region usually possesses. So, great works are necessary for the construction of new roads and for increasing the width of existing ones. To-day, the army in Alpine territories disposes of a network of communications well arranged for the development of the operation, but it requires an incessant and intense work for its maintenance.

A special organization, imposed by the winter season, was that directed with the object of keeping the communications free from snow, conditions essential for securing the life of the troops. The roads have to be always free from snow and fit for sledges. They must however have a slight stratum or layer of snow. For the better execution of this work the road network is subdivided in portions and entrusted to the charge

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of officials similar to civil engineers. Each portion comprises a certain number of stations, with the necessary workmen and shelters for animals, and stores for the tools, etc.

In the higher mountain zones, for freedom from the snow excavated galleries are preferred. These galleries, which for all the front measure hundreds of kilometres, were 2 metres in width and height and allowed for free passage of the baggage. They saved the work of disencumbering the snow and assured a continuity of transit even in the case of storms or violent winds. In some places more dangerous from land slides and avalanches the galleries were excavated in the solid rock as those at the Corno della Vecchia in the Conca d'Arno (Valle Camonica).

Finally it is worthy of note to record the valuable work done by our skiers, who under very unfavourable conditions maintained the communications with the more elevated localities. If in the mountains the gravest obstacles were those of the snow, in the plains the abundant precipitation was the cause of inundations. But the arrangements provided in time (watercourses, embankments, rapid transmission of alarm signals) tended to limit sensibly the damaging effects.

The importance of the movements of transport during the winter may be judged by reference to one of the principal stations on the Isonzo which from October to February transported 17,000 officers, 380,000 troops, 19,000 workmen, 29,000 quadrupeds and 2,500 wagons.

*Commissariat.*

The victualling service during the winter assumed a complex character owing to the greater needs of the troops and the difficulties of transport. Advanced bases were formed, provided with abundant depôts of provisions, forage, firewood, etc., and resting places for men and animals. From the storehouses to the bases the transport was effected by autocars, and from the bases to the troops by sledges or wire conductors according to circumstances. In the more difficult zones, winter depôts were formed, partly for provisions continually requiring renewal and partly for reserves. So that the detachments, who it had been foreseen would be blockaded in the snow for six months, were able to live without inconvenience. Abundant rations were provided for supplying warm food and drinks to those affected by the cold or by fatigue, frozen meat being largely used, and wine of a kind that resisted freezing. Special kinds of food were also distributed to the troops in the trenches and those exposed at great altitudes; rum, marsala, coffee and tea. With the use of field kitchens, thermos spirit lamps and all kinds of heating apparatus, two warm meals could be given daily to the soldiers.

Special attention was given to the supply of potable water, especially in the more arid zone such as the high plain of Asiago and the Carso. Plant was constructed for extracting the water from the sub-soil, and for raising and conducting it to the first lines. For the Carso about 3,000,000 litres of water were supplied daily. Other aqueducts were in use on the high localities of Asiago, all the plant being placed in action by electric motors. In the case of interruption owing to exceptional freezing special arrangements were made with covered tanks and cisterns, etc.

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*Sanitation.*

Sanitary organization was a subject of the greatest care. Special arrangements had to be made in the mountainous countries for the transport of the sick and wounded by difficult routes and under unfavourable atmospheric conditions. In cases where the transport had to be effected in the plains from posts far distant from one another there were several hospitals. For the transport of the sick, wire conductors, ambulances, sledges, wagons, autocars and hospital trains were used.

Bacteriological offices for periodical vaccination and for frequent examination of potable waters, and for disinfection, were also provided, for combating the results of frostbite and damp. The organization for convalescents and for sending these from the war zone and returning those cured to the army was also perfected. The results obtained were in every way satisfactory, the death roll of the forces descending to 1·5 per cent. and epidemics being reduced to a minimum. Assistance to the civil population in the war zone was also not forgotten. The sanitary service was carried on with the patriotic devotion of the Red Cross and Military Order of Malta in assisting in the work of succour to the sick and wounded and carrying comforts to the first line.

Assiduous care was given to the animals, and for the removal from the mountains to the plains of such as were not necessary for the exigencies of the service during the winter. For the remainder stables and covered shelters were provided.

*Telegraphic, Telephonic, and Postal Communications.*

Among the other services that worked regularly, the development of the telegraphic and telephonic communications, on which depended so much of the activity of the army, are well worthy of note. It may be recorded for example, that in the zone of one of the Italian Armies there existed 5,000 kilometres of telegraph lines besides 3,000 kilometres of wire for the immediate service of the artillery; there were distributed 3,000 telephones and the number of telegrams and phonograms amounted to about 10,000 a day.

*Military Operations.*

*Instruction and Moral Preparation.*—The indispensable element of success in modern warfare is the perfect knowledge of the complex affairs of which it consists, of the intricate mechanism which regulates it and especially in a knowledge of the technicalities by which it is conducted. Hence, the importance of instruction for the troops, and especially in the winter. Many spaces were allotted for the instruction of the units in exercises of attack and defence, in target practice with rifles and mitrailleuses, and in numerous subsidiary details. Special courses were instituted for instruction of officers in staff work, on the use of bomb throwing and the mitrailleuse, on works of defence, and various specializations of artillery, on photography, ski-ing, etc. Other spaces under the direction of able teachers were allotted for improvements in the study of war, and lectures were given to the troops in well warmed and comfortable places.

Operations of some importance were carried on at the head of the valley of S. Pellegrine. Here, on the 4th March, one of the Italian detachments stormed a strong position at about 2,700 metres capturing

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61 prisoners, 1 gun, and 2 mitrailleuses. On the night of the 17th the enemy destroyed the defences on this position by a violent artillery fire, and occupied a portion on the more elevated part. His further attacks on the 20th were repulsed.

Further to the north there were interesting episodes of mine warfare. Ab Sief (Height of Cordevole) had commenced excavating with a view to blowing up some of the Italian positions. Having ascertained the direction of the galleries, the men prepared a countermine that was exploded on the 5th March, demolishing part of the enemy's lines. On the Giulia front and especially in the Gorizia zone, greater activity was developed owing to the milder conditions of climate. From the end of December, 1916, until the first days of the following February there were some small engagements to the east of Gorizia resulting favourably for the Italians. On the evening of the 9th February, after a violent artillery fire, the enemy launched three attacks on the slopes of S. Caterina, S. Marco, and south-east of S. Pietro and succeeded in occupying some short spaces of the trenches. On the night of the 12th and the following morning, the Italian infantry with persistent assaults recovered the whole of the position, capturing more than 200 prisoners, and inflicting severe losses. Successive counter-attacks by the enemy on the 14th, 15th, 22nd, and 28th were all repulsed. The enemy's attacks on the Italian lines to the east of Verthoiba on the 3rd and 6th March were equally repulsed and 32 prisoners and 2 officers were captured. On the Carso the Italian infantry advanced with bayonet charges on some further tracts in the Italian front, especially in the sector north of the road from Oppacchiaselia to Castagnavizza and in the vicinity of the height 208. On the 18th January the enemy brought to bear violent artillery fire against the Italian lines in the southern sector and especially in the Faiti Wood, and then attempted attacks with infantry detachments which were all repulsed.

Notable incidents in aerial warfare were bombardments by aviators of the enemy's camps at Dorimberga and Comeno on the 20th December, and on the railways and barracks at Rifemberga S. Daniele and Cobdil on the 8th January; the bombardment of the enemy's hydroplane stations on the Trieste Harbour, and the aviation camp in Prosecco on the 12th January; then on the dockyards at S. Rocco, and on the railway station of Opcina, on the 11th February. Dirigibles also bombarded the enemy's camps near Comeno, on the night of the 21st February, the aviation camp at Prosecco on the night of the 23rd, the railway station at Rifemberga on the 26th February; the station of Calliano on the night of the 18th March. Attempted raids by the enemy, inflicting some losses, were made at Aquileia, Monastero and C. Farello on the night of the 12th January, on Villa Vicentina and Cervignano on the 12th February, and on Gorizia on the 13th March. In several aerial combats 12 of the enemy's machines were brought down by artillery fire. The Italian losses were four.

On the Albanese front no important events occurred, with the exception of small territorial gains in the mountainous zone between Vaiussa and Osum (F. Devoli) made with the object of connecting the Italian lines with those of the French, and barring the communication between

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the lake zone (Central Albania) and the Epirus. In the aerial raid on Valona two of the enemy's hydroplanes were brought down and the Italians lost one machine.

On the Macedonian front the transfer took place of Italian troops from M. Baba west of Monastir to the Cerna zone and east of that locality. On the evening of the 12th February, after a violent artillery preparation assisted by incendiary bombs and inflammable gas, the German troops broke through the trenches on the height of Quota 1050 east of Paralovo, occupying a tract of about 200 metres. On the 13th by a vigorous counter-attack the Italians recovered the positions except a small tract which had been completely destroyed by the enemy's fire. On the 14th the Germans attempted a counter-attack which was repulsed with grave losses to them.

On the morning of the 27th February, the Italian infantry, by a sudden assault, seized a tract of trenches not yet reoccupied and captured 71 prisoners. The enemy exploded a mine which buried many of the Italian infantry, and from this moment the Quota 1050 could not be occupied by the troops of either of the combatants. The problem of creating satisfactory conditions of life under the great difficulties of ground, weather, and the enemy, together with the numerous requirements imposed by the custom of modern civilization and the complicated mechanism, was completed successfully, and with the resourcefulness and adaptation that is characteristic of the Italians. Since, in modern warfare, military operations represent the result of long periods of assiduous preparation and these results were obtained by the renewal of the energy put forth in the winter season, the Italian Army is filled with confidence, and auspicious of victory in the new year of the War.—*Agenzia Stefani.*

### Resumption of Italian Military Operations.

The long period of rest imposed on the operations by the winter and protracted by the inclemency of the weather during the whole of April was a time of useful preparation for the Army. With the assistance of the Government and the fervid co-operation of all the energies of the country, the supreme military authority devoted itself actively to developing the organization of the Army, and increasing and reinforcing regiments and squadrons. The transport and commissariat services were perfected and there was issued to it great quantities of war material of every kind, adapted to the new invention of military science. New regiments were created and formed into great units, organically complete with their auxiliary services. Heavy artillery was constructed and distributed and the number of mitrailleuses was largely increased. At the same time the production of munitions and explosives allowed for great issues and abundant reserves, which are indispensable for conducting heavy offensive actions of every kind and for securely guarding the front in the eventuality of having to oppose a tenacious defence against the violent offensive of the enemy. The engineer services were also largely increased. Great encouragement was given to aviation, more numerous and more powerful machines being provided in order to supply this new arm with ample means for the offensive,

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and greater facilities for exploration. With these diverse forms of activity harmoniously co-ordinated to a final purpose, the Italian Army, strengthened by experience and encouraged by past results was prepared to confront its third spring of the War.

*Direction of the Attack on the Julian Front.*

The idea of the supreme command for the spring offensive was as follows:—At first to attack the enemy on the whole of the Tolmino front with intense artillery fire, to keep it in suspense, and uncertain as to the real direction of the decisive attacks; then to make the assault on the right wing to the south of Gorizia and, finally, for the second time to launch an attack on the Carso.

*On the Middle Isonzo.*

The first phase of the action that had for its objective the heights on the left of the Isonzo from Globna to Salcano was entrusted to the Army of Gorizia. This operation had to be carried out by means of a heavy frontal attack assisted on the right by a resolute thrust on the Gorizian heights and masked on the left by a demonstrative action and a crossing of the Isonzo between Loga and Brodez, with direct threats from the rear on the enemy's positions on the elevated plain of Bansizzo-S. Spirito.

An energetic demonstration on the left of the 3rd Army on the southern margin of the Carso promised success, and the operations commenced on the 12th May with an accurate artillery preparation. The fire gained its maximum violence and intensity on the morning of the 14th. At midday the Italian infantry commenced its advance from Plava and Gorizia. The Quota 383 east of Plava (Poggio Montanari) was won by the Udine Brigade (95th and 96th Regiments) while the Florentine Brigade (127th and 128th Regiments) with magnificent valour succeeded in gaining the spur of Quota 535 of Cucco. At the same time the brigade Avellino (231st and 232nd Regiments) overcame with irresistible force the defences of Zagora, and partially occupied the little forts of Zagomila; the 230th Infantry (Brigade Campobasso) scaling the slopes of Monte Santo penetrated in the evening to the convent east of Gorizia, and the Messina Brigade (93rd and 94th Regiments) captured the strongly fortified heights of Quota 174 to the north of Tivoli. On the remaining tracts of the front, the pressure was very strong; everywhere the enemy's tenacious resistance compelled the Italian troops to engage in a very active combat.

On the night of the 15th, a detachment of two battalions—37th Bersaglieri and Alpines Corrino—and auxiliary detachments forced the passage of the Isonzo between Loga and Brodez, completely surprising the enemy. At dawn on the 15th the attack on the heights was renewed with fury. They regained the Summit 611 of Cucco and the Quota 524 of Vodice, repelling the enemy's most violent attack, and the occupation of Monte Santo and the Italian lines was established below the summit. On the following day, and up to the 22nd, the ground gained on the 14th and 15th was completely consolidated.

These were days of extremely violent fighting, and of imperishable glory for the Italian troops. Under hurricanes of fire many counter-

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attacks were repulsed, and the positions gained were consolidated for defence ; the successes were increased by the occupation of the heights of Quota 363 (east of Plava), of the localities of Giobna and Palliova and with the secure possession of the entire mountainous ridge which, culminating in Monte Cucco, separated the Isonzo from the deep valley in front of Alnovo.

The bridgehead of Brodez, having fulfilled its function, was abandoned on the 18th. At the same time the actions on the heights above the Isonzo were developed further to the south along the southern margin of the Carso, these operations being entrusted to the 3rd Army. For several consecutive days our troops also made progress north of Dosso Faiti and towards Quota 126 to the south of Tippacco. At the same time the possession of the rocky bulwark of Monte Cucco and Monte Santo was assured and our lines were carried to Quota 368 and Quota 592, and to the slopes west of Monte Santo. 7,113 prisoners, including 163 officers, 18 guns, very numerous bomb mortars and mitrailleuses and immense quantities of war material were the results of this first stage of the Italian offensive.

*The Austrian Diversion.*

As soon as the attack on the heights to the left of the Isonzo had been developed, the enemy attempted to carry out a complete diversive action in order to distract attention. This action became intense from the 19th to the 22nd May, with very violent concentrations of fire on the Italian positions on the ridge of Val Sugana and on the high plain of Asiago, and various attempts were made to break through by the enemy's infantry to the west of Garda and in Val d'Adige.

On the night of the 21st an assault was delivered on the Dente del Pasubio, but the attack was repulsed with heavy losses. Other furious attacks were made on the 22nd with large forces against the Italian positions, Piccolo Colbricon in the valley of Travignolo. These, after some preliminary successes, ended in complete failure of the enemy, who left many prisoners in the hands of the Italians, besides several hundreds of dead.

*On the Carso.*

The endeavours of the enemy intended to distract attention had no other effect than that of causing heavy losses without succeeding in modifying the decision of the Supreme Command, who, now thoroughly prepared, gave orders for the commencement of the second phase of action on the Carso.

From 6 a.m. to 4 p.m. on the 23rd the artillery of the 3rd Army bombarded with extreme violence the enemy's positions which had escaped the previous bombardments, and at 4 p.m. the infantry leapt over the parapet. On the left, in conformity with the plan of the Command, the action was only demonstrative, but was carried out with much decision and bravery. On the centre and right from Castagnavizza to the sea, the enemy's trenches in front of the Italian lines were captured by the Bologna Brigade (39th and 40th Regiments) on the road between Castagnavizza and Boscomalo. 130 aeroplanes took part in the battle, including a group of hydroplanes.

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The enemy who at first replied weakly to the destructive fire of the Italians, reserving its power to arrest the infantry attack, was surprised by the rapid incursion of the latter, and towards evening made violent counter-attacks and opened an intense bombardment. But now the victory was in the hands of the Italians, and more than 9,000 prisoners, of whom 300 were officers, were taken by them.

The battle was renewed at dawn on the 24th, being prolonged on the sea by two monitors which bombarded the enemy's position on the coast. The left of the 3rd Army following in support, engaged the enemy and resisted his counter-attack with the Barletta Brigade (137th and 138th Regiments) while the centre undertook the operation of isolating and capturing the salient of Boscomalo, succeeding with the Brigades of Mantua and Padua in regaining the slopes of the heights Quotas 235 and 241 of the Fornaza region, and pushing forward to Quota 219 north-east of Komarje. On the right, the Tuscan and Arezzo Brigades made a brilliant frontal attack near the enemy's lines of Flondar. On the 25th the left wing succeeded in capturing some portion of the enemy's trenches in the direction of Castagnavizza, and the centre completed the capture of the Boscomalo Salient.

On the 27th the Italians completed the occupation of Quota 210 of Fornaza, whilst the right occupied the trenches east of Komaje and San Giovanni. On the 28th detachments of the 45th Division, on the extreme right, pushed forward beyond the Timaro as far as the height Quota 28 which however they were not able to retain. On the following days up to the 31st the Italians rectified and reinforced the conquered positions. The most furious actions were those on the 24th at Tivoli, Grasigno, and on the 26th at the head of the valley of Palliova. From the 29th to the 31st three successive attacks on Vodice were repulsed by the 53rd Division.

16,568 prisoners including 441 officers, 20 guns, a great number of mitrailleuses and shells were captured. Also a formidable network of trenches which had kept back the right wing was captured. Prisoners made from the 14th to the 18th May numbered 23,681 (604 officers) ; 38 guns (13 were of medium calibre), 148 mitrailleuses and 27 mortars, besides a large quantity of rifles and war material. The Italian lines from Castagnovizza to the rear were advanced from 1 to 4 kilometres.

*(To be continued).*

E. T. THACKERAY.

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## *FIELD COMPANIES, R.E., ON THE LINE OF MARCH.*

THE Editor has received a contribution bearing the above title from "A Field Co. 2nd in Command." The name of the writer was not enclosed, and *no article can be considered unless properly authenticated.* If however a contributor desires his name to be withheld from publication by the Editor there is no objection to that course being pursued.

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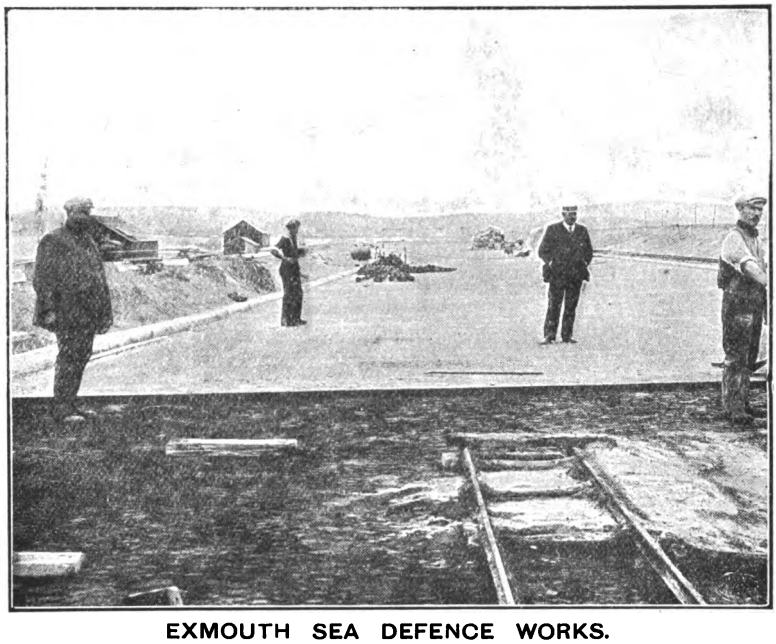

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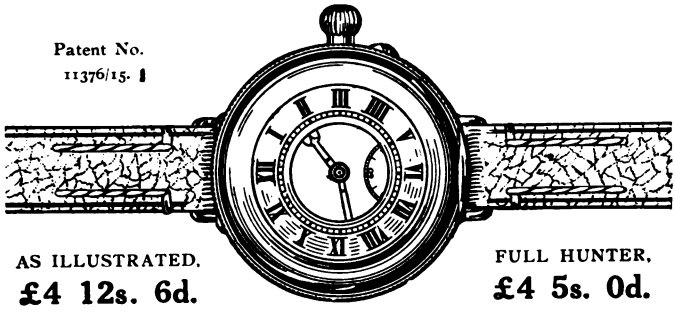

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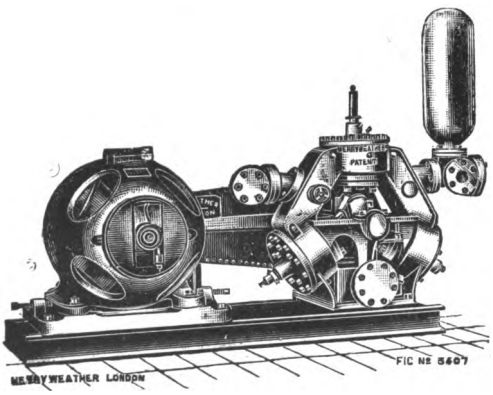


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# *NOTES ON A DIVISIONAL LAUNDRY.*

*By* CAPT. R. E. STRADLING, *Adjutant, Divisional Engineers.*

*General.*—Orders were received to construct a Divisional Laundry on a sufficiently large scale to take the following laundry machinery :

Three Washing Machines.
Two Hydro Extractors.
Steam Boiler.
Portable Steam Engine.
Steam Drying Apparatus.

No details of these machines could be obtained at first, but later, information was supplied as to makers' names, and we were able to obtain catalogues from the firms, with details. These enabled an estimate to be made of floor space required for the various machines.

Timber was scarce, and only small scantlings obtainable, so the roof trusses had to be designed accordingly. Roof covering was corrugated iron, and the walls rough boarding, felted on outside.

*Site.*—Site was on sloping ground towards a stream which was dammed to provide the water supply. The main road ran parallel with the direction of the slope, and a switch road ran along upper end. A lorry standing was made to the front of the unloading shed, so that lorries might back off the switch road, and unload direct into shed.

*Unloading Shed and Disinfecting Rooms.*—The loading shed was 28 ft. 4 in. × 8 ft. and each disinfecting chamber 8 ft. × 8 ft. × 8 ft. These were designed to prevent as far as possible any contamination between the verminous clothing, and those disinfected. For this reason, two doors were put to each disinfecting chamber. The outlet door for disinfected articles opened into a space which was partitioned off from the unloading shed to which the inlet door opened. There was some difficulty in getting either concrete or brick for these chambers, so they were constructed with concrete floor only, the walls and roof being wood partitions lined inside with sheet iron, jointed with red lead and spun yarn, and covered outside with match boarding, and packed in between with sand. The doors and door frames were made with oak, and covered with sheet iron, special strap hinges being made.

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From the disinfecting chambers the clothes were placed on a charging platform, running along the outside of the wash-house, from which they are pushed through shutes to the washing machines. Disinfecting was arranged by wet and dry steam in coils. Under the charging platform runs the shafting from which the washing machines are driven.

*Wash-House.*—Wash-house 35 ft. × 27 ft. 6 in.

*Washing Machines.*—Three washing machines. One by Bradford. Two by Smith Paget. Layout of machinery as shown in sketch.

*Rinsing Machines.*—Though the rinsing can be done in the washing machines, it was thought a saving could be effected if special apparatus was put in for this. The idea of those designed and erected here was obtained from a local laundry, at the hospice near by. A few adaptations were found necessary. From these machines the clothes pass to the hydro extractors.

*Hydro Extractors.*—These are Bradford machines, driven from an overhead shaft, from which the paddles of the rinsers are also driven. The support of this overhead shafting caused some slight difficulty, but was overcome by the erection of two inverted " A " frames, as stiffeners.

*Drying Rooms.*—Two drying rooms, each 20 ft. × 23 ft. From the wash-house the clothes are taken to the drying rooms, of which there are two, to be used alternately. The heating was by a steam coil, over which air was driven, by a fan, into the chambers. This fan was driven by a small petrol motor. This was an extra to the machinery supplied as a " set." If it had been known at first that this type of heating was proposed it might have been possible to arrange to drive it from the steam engine. From the drying rooms the clothes pass to the mending rooms.

*Mending Rooms.*—Two mending rooms, each 21 ft. × 20 ft. The only point about these is that as much light as possible should be allowed, and for this reason glass, instead of oiled linen, was used in the windows. From the mending room clothes pass to the ironing room.

*Ironing Room.*—One ironing room, 44 ft. × 20 ft. This room should be as light as possible. From this the articles pass to the sorting room.

*Sorting Room.*—One sorting room, 14 ft. 8 in. × 20 ft., and thence to the

*Clean Clothes Store Room.*—29 ft. × 20 ft. This is provided with shelving. The motor lorry track to the door of the clean clothes store enables loading to be done direct from the room.

*Engine Room.*—25 ft. × 20 ft. The engine was by Ransome and Portable, and

*Boiler.*—By Ruston-Procter. Floor=concrete. Foundation plan for boiler, obtained from makers. The drive from engine was in

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two directions, one to shafting under sharging platform, and one to overhead shafting over hydro extractors.

*Steam and Water Piping.*—Steam was laid on to the following :— Hot-water tank. Washing machines. Cock in wash-house, for soap solution. Steam heating coils to drying room.

*Hot Water* was laid on to Washing machines, Rinsers, Soap solution cock.

*Cold Water* was laid on to Washing machines, Rinsers, Soap solution cock, Engine and boiler, Hot water tank, Petrol motor tank.

*Water Supply.*—Stream at bottom of field dammed, and water pumped by a Merryweather Steam Pump to cold-water tank through a 2 in. main.

*Drainage.*—A 4-in. iron pipe took laundry effluent about a thousand yards to a field over which it was spread to be treated by broad irrigation. This method of treatment was suggested by D.M.S. (Sanitation), —— Army, as no chloride of lime was available.

*Output.*—Test was run, and about 10,000 articles were dealt with, in one day. This division left the area after these first tests, and so no further information can be given on this point. With good organization this 10,000 should easily be dealt with in an 8-hour working day.

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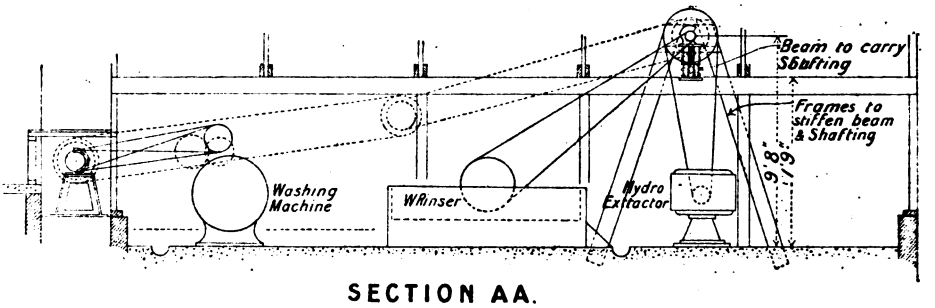
## PLAN SHEWING ARRANGEMENT OF MACHINERY

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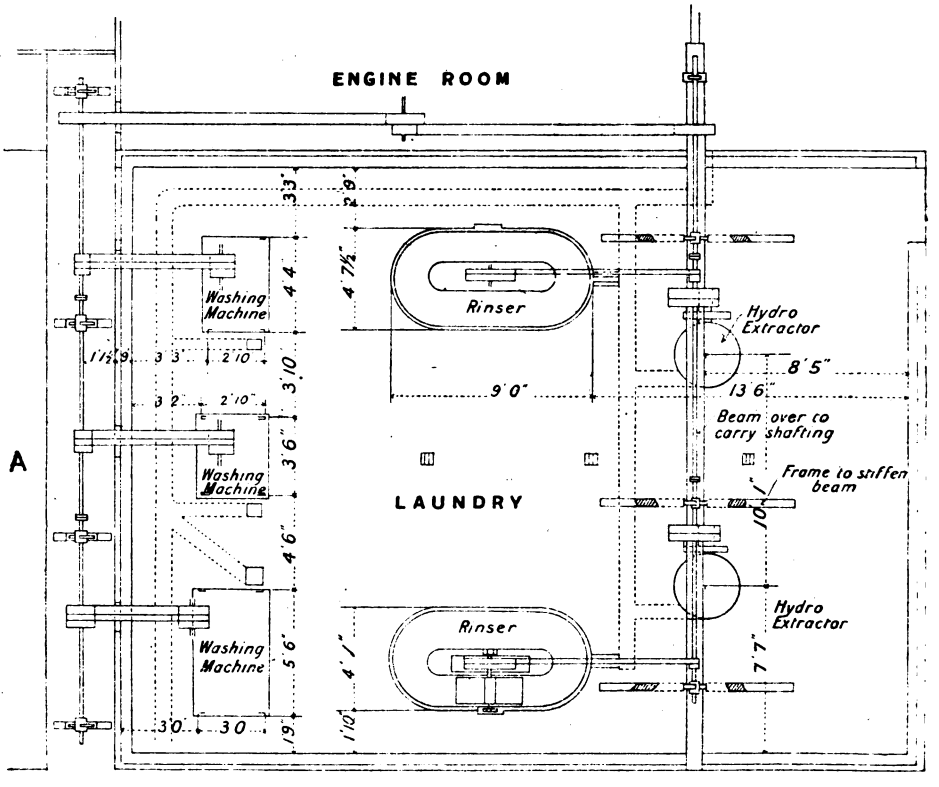


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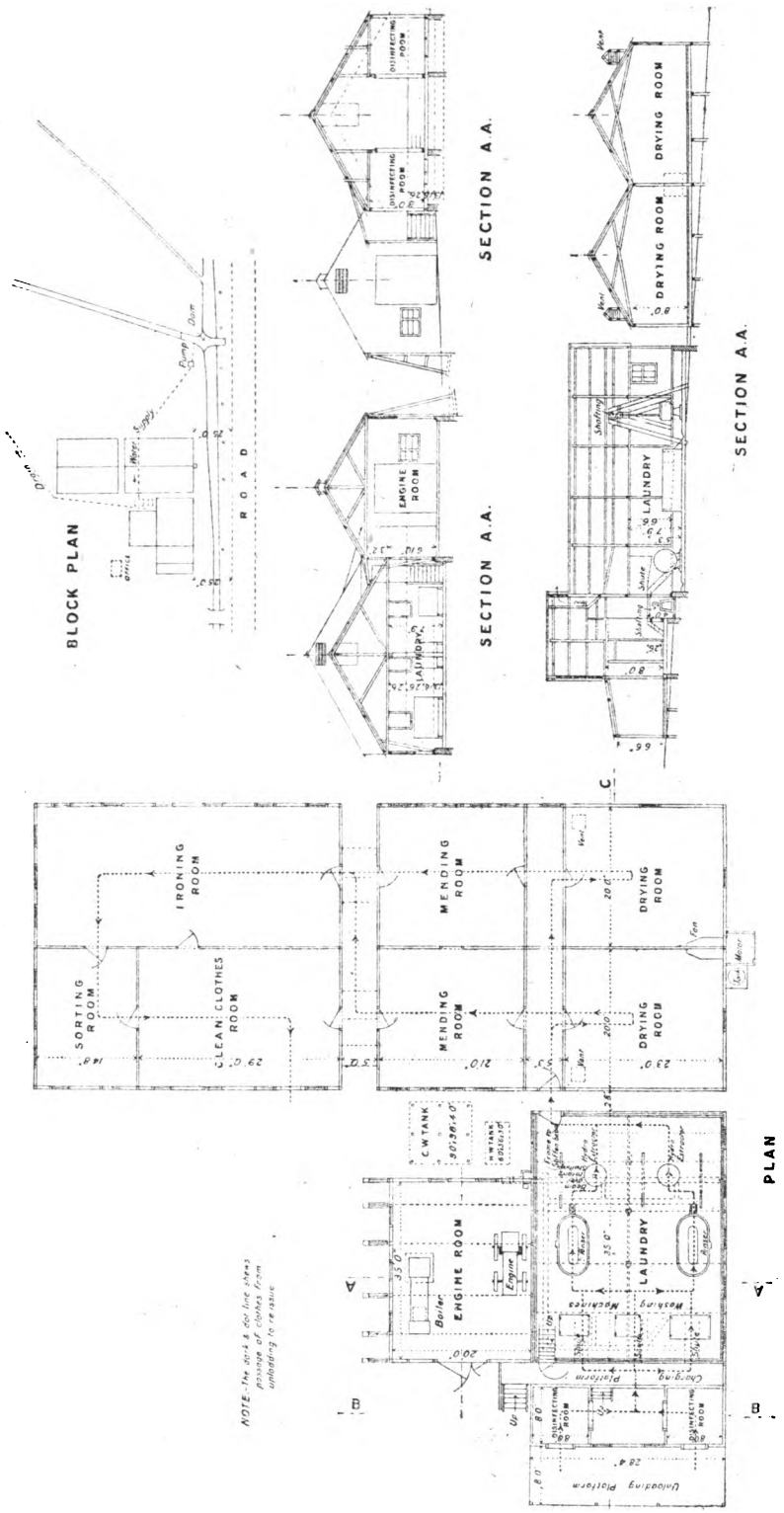


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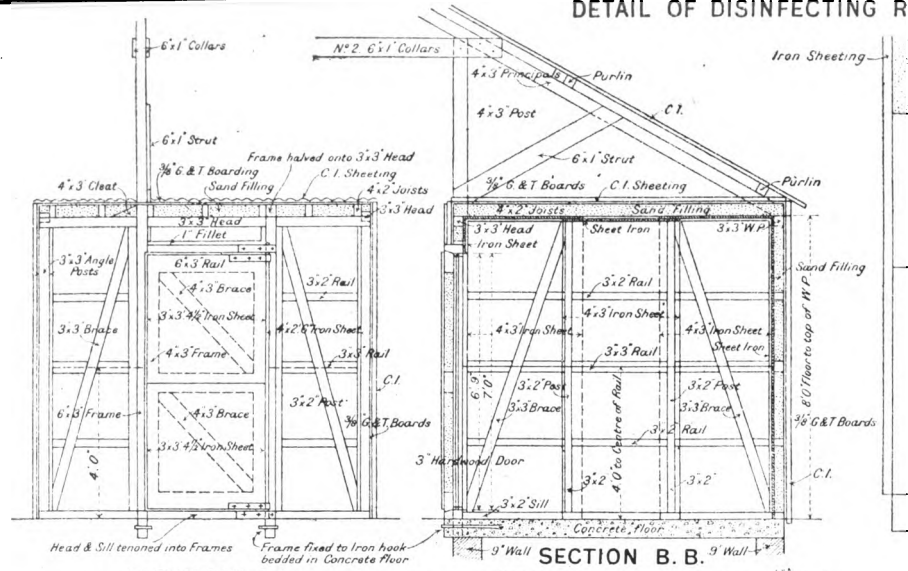
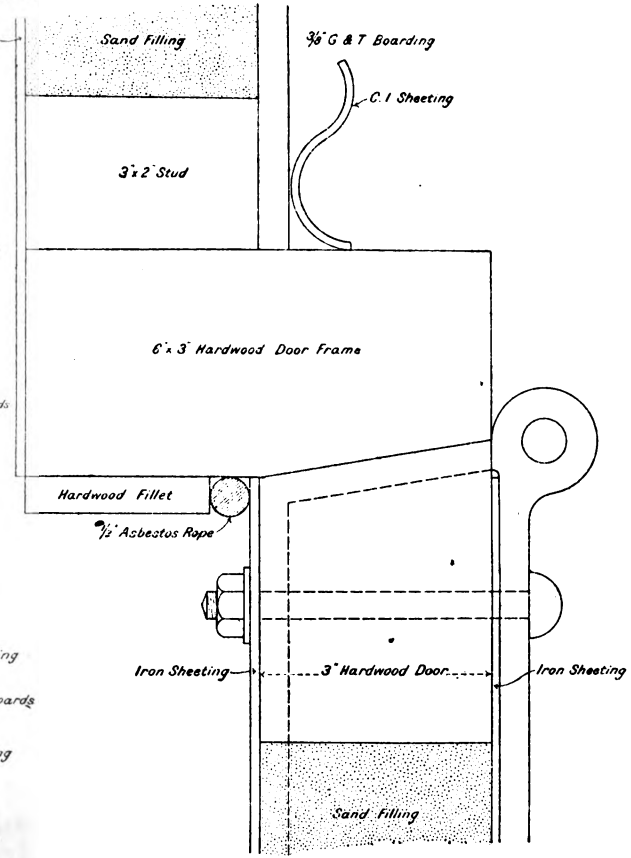
# DETAIL OF DISINFECTING ROOMS.




NOTE:- All joints inside Disinfecting Room whether between Iron & Iron or Iron & Wood to be made in Red Lead




DETAIL OF DOOR FRAME.

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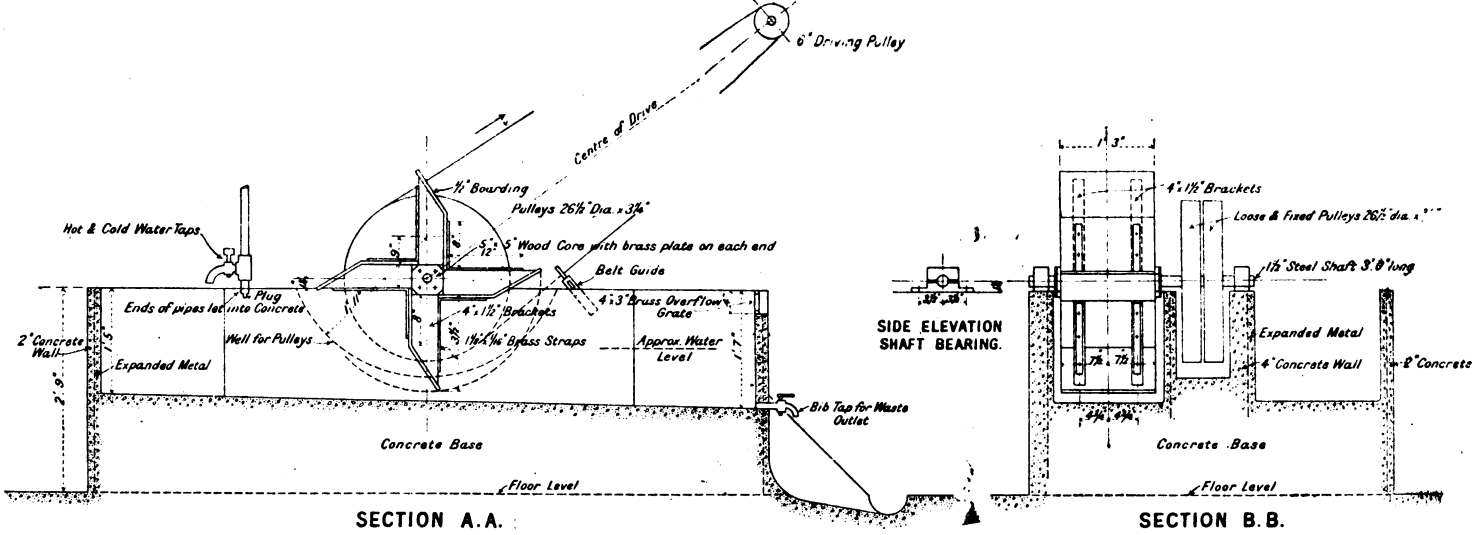


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# *THE HOLDING POWER OF NAILS.*

*By* 2ND LIEUT. J. M. HANCHARD GOODWIN, R.E.

IT came to my notice a few months back, at an examination set at the R.M.A., that the text-books on Military Engineering were very incomplete and inexact on the subject of Nails and their Holding Powers. It struck me at the time that a mathematical course of reasoning might produce a formula to replace the long series of concrete examples given in *M.E.*, IIIA., somewhat in the way of the Gordon's Formula approximation; that is to say that a definite mathematical form could be obtained to which physical experimental constants could subsequently be added.

The subject divides itself under two headings: Drawing by direct pull, and drawing by indirect pull. The first is made use of, to take an example, when a pair of pincers or a claw-hammer extract a nail from a piece of wood; the second is found in such cases as supporting a transom against the side of two legs by means of nails. In the first case the nail, if pulled directly, comes out straight; in the second the nail is bent.

## CASE I.—DRAWING BY DIRECT PULL.

Imagine a nail to be imbedded in a piece of wood and a tension to be exerted on its head until the nail commences to draw. At this stage of the proceedings the maximum friction is being exerted between nail and wood, and is equivalent to the withdrawing force. To determine the total frictional force developed it is necessary to find the pressure exerted by the wood on the nail; I propose to show that this pressure is equivalent to the ultimate resistance of the wood to shearing.

Consider for a moment what happens when a nail is hammered into a block of wood. First it parts the fibres of the wood, and then, as the stress approaches the ultimate shearing stress of the fibres, they break, so that the pressure on the nail cannot exceed this stress. Evidently, also, the stress cannot be less than this value, for if so the fibres should not have broken. Call this stress

S lbs. per sq. in.

Then if "$\mu$" is the coefficient of friction between wood and nail, and "A" is the total area subject to the above stress, it follows that the force required to draw the nail is

$$\mu AS.$$

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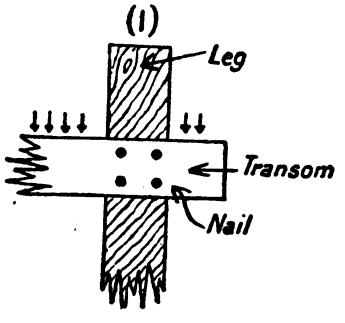
This is not strictly true, but very approximately so. The strict truth is that "A" is the area sustaining the pressure, resolved at right angles to the line of drawing of the nail. The deviation is so small as to be negligible.

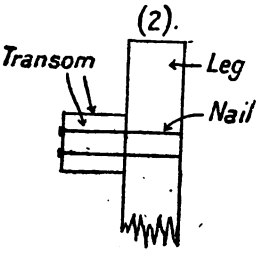
The value "$\mu S$" is a function of the wood alone, for that part of "$\mu$" which applies to the nail is obviously constant, except where the nail is rusty. What is required, therefore, is a table of drawing values for different woods, similar to the table of ultimate, compressions, tensions, etc., in Part IIIA., *M.E.* A table of areas per inch length of different nails would also be of use. With these two tables prepared, the direct holding power of a nail is a mere matter of one slide rule adjustment.

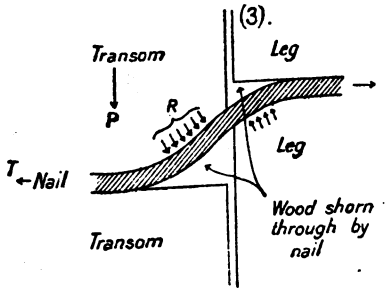
## Case II.—Drawing by Transverse Pull.

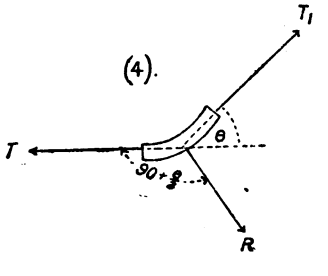
The second case is slightly more complex. It deals with circumstances such as that shown in *Figs.* 1 and 2. The actual supporting power of the nail is due

1. To its rigidity.
2. To a longitudinal tension which comes into action as soon as the nail commences to bend, as in *Fig.* 3.




Consider the forces acting on the nail as it is about to draw. We may consider each half of the nail as being pulled horizontally with a

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force T. Pressing upon each side of the nail are equal and opposite forces, the pressure, P, of the transom and the reaction of the leg. Beyond this there is a sideways integrated reaction, R, on each half, the pressure of the wood through which the nail has shorn.

We can draw a force diagram for each half of the nail considering it as a rigid body ; the only part that concerns the present question is one-half of the curved portion of the nail. Take the left-hand portion.

There is the tension T pulling to the left. There is the tension $T_1$ pulling at the maximum angle of bend, which we will call $\theta$. There is the reaction, R. Moreover $T_1$ and T are very nearly equal ; for the present purpose they may be put equal to each other.

In this case therefore R bisects the angle T, $T_1$.

$\therefore R = 2T \sin \frac{\theta}{2}$, and acts at an angle of $90 + \frac{\theta}{2}$ with the horizontal pull T.

Now consider the equilibrium of the transom. There is the pull of the nail at an angle $\theta$ equal to $T_1$ (=T) ; there is a reaction $R_1$ equal and opposite to R above ; and there is a downward pressure P.

Therefore we have its equilibrium as shown in *Fig.* 5 ; and consequently

$$R_1 \cos \left(90 - \frac{\theta}{2}\right) = T_1 \cos \theta.$$

*I.e.* $$R_1 \sin \frac{\theta}{2} = T_1 \cos \theta.$$

*I.e.* $$R \sin \frac{\theta}{2} = T \cos \theta.$$

Substituting : $$2T \sin^2 \frac{\theta}{2} = T \cos \theta.$$

*I.e.* $$2 \sin^2 \frac{\theta}{2} = \cos \theta.$$

*I.e.* $$1 - 2 \sin^2 \frac{\theta}{2} = 1 - \cos \theta.$$

*I.e.* $$\cos \theta = 1 - \cos \theta.$$

*I.e.* $$\cos \theta = \tfrac{1}{2}, \ \theta = 60^\circ.$$

That is to say, that the maximum angle taken up by a nail, bending in a piece of wood, is 60°. The meaning of this is important. It shows that in a piece of soft wood the conformation taken up by the nail will be as in *Fig.* 6, with the bend extending over a long distance;

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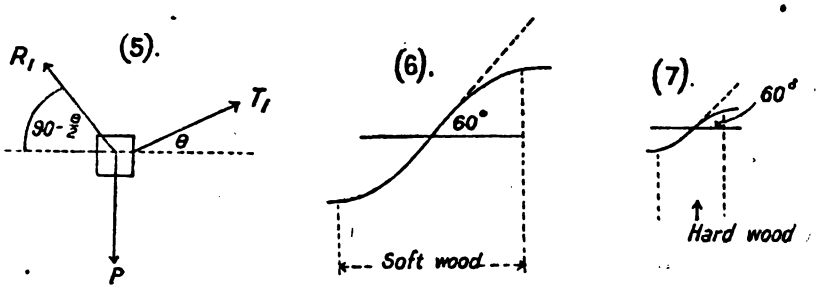
while in a piece of hard wood the amount of bend is the same but it extends over a smaller length (*Fig.* 7).




Returning to *Fig.* 5 once more.

$$P = R \sin 90 - \frac{\theta}{2} + T \sin \theta$$

$$= 2T \sin \theta = \sqrt{3}T.$$

But T is nearly equal to the tension required to draw *directly* the portion of nail imbedded in the leg, *i.e.*$=\mu SA$.

$\therefore P = \sqrt{3}\mu SA$, where A is the area of nail in the leg.

It will be noticed that the area of nail in the leg is all that matters; the head of the nail will provide an equal and opposite tension in the transom.

$\therefore$ we have :—

The transverse pull a nail is capable of resisting is $\sqrt{3}$ times the direct pull it can sustain. This direct pull is the product of the length of nail imbedded, the area per inch length, and the "drawing value," the product $\mu S$, of the wood.

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# *HORSEWATER TROUGHS AND HORSEWATER POINTS.*

*By* CAPT. H. S. BRIGGS, R.E.

WITH reference to recent articles in the *R.E. Journal* showing designs for horsetroughs and horsewatering points, the drawing reproduced herewith is offered as an alternative and more practical design. It is claimed that the following advantages over the designs referred to are gained.

(*a*). Economy of labour in constructing the standings. The dimensions shown are ample, and ensure horses filing right up to the end and not passing behind one another. Although horses can approach the waterpoint across country in dry weather, experience has shown that they must be allowed to use the roads in wet weather. To avoid congestion of traffic, therefore, the waterpoint should fulfil the following conditions :—

(1). It should consist of two or at the most three canvas 600-gallon troughs, each trough watering about 300 horses an hour. Large waterpoints watering thousands of horses per hour are a mistake. (2). It should be sited on a bye road. Long approach standings are then unnecessary and the waterpoint can be placed right alongside the road, as shown on the drawing.

(*b*). Economy of labour in drainage arrangements. The floor of the watering place should be raised above natural ground level by the simple expedient of putting the material straight on the ground and thus avoiding the heavy earthwork frequently undertaken. If the floor is given a slope outwards each way, a shallow trench all round will do all the drainage necessary. Halved pit props with a couple of inches of stone, mine earth, or broken brick on top make a luxurious standing. There are, however, numerous alternatives, one of which is to have none at all. This method invariably leads to trouble.

(*c*). As regards design of trough the ordinary 600-gallon canvas trough, supported by a timber backing, is best. If the trough is to last it must be supported at the sides and bottom. The canvas soon rots if allowed to take the weight of the water. A trough frame and canvas trough as shown on the drawing possess the following advantages over the sheet-iron variety as usually made :—

(1). Portability. The wood frame can often be made of timber found in ruined villages and then only requires the canvas to complete.

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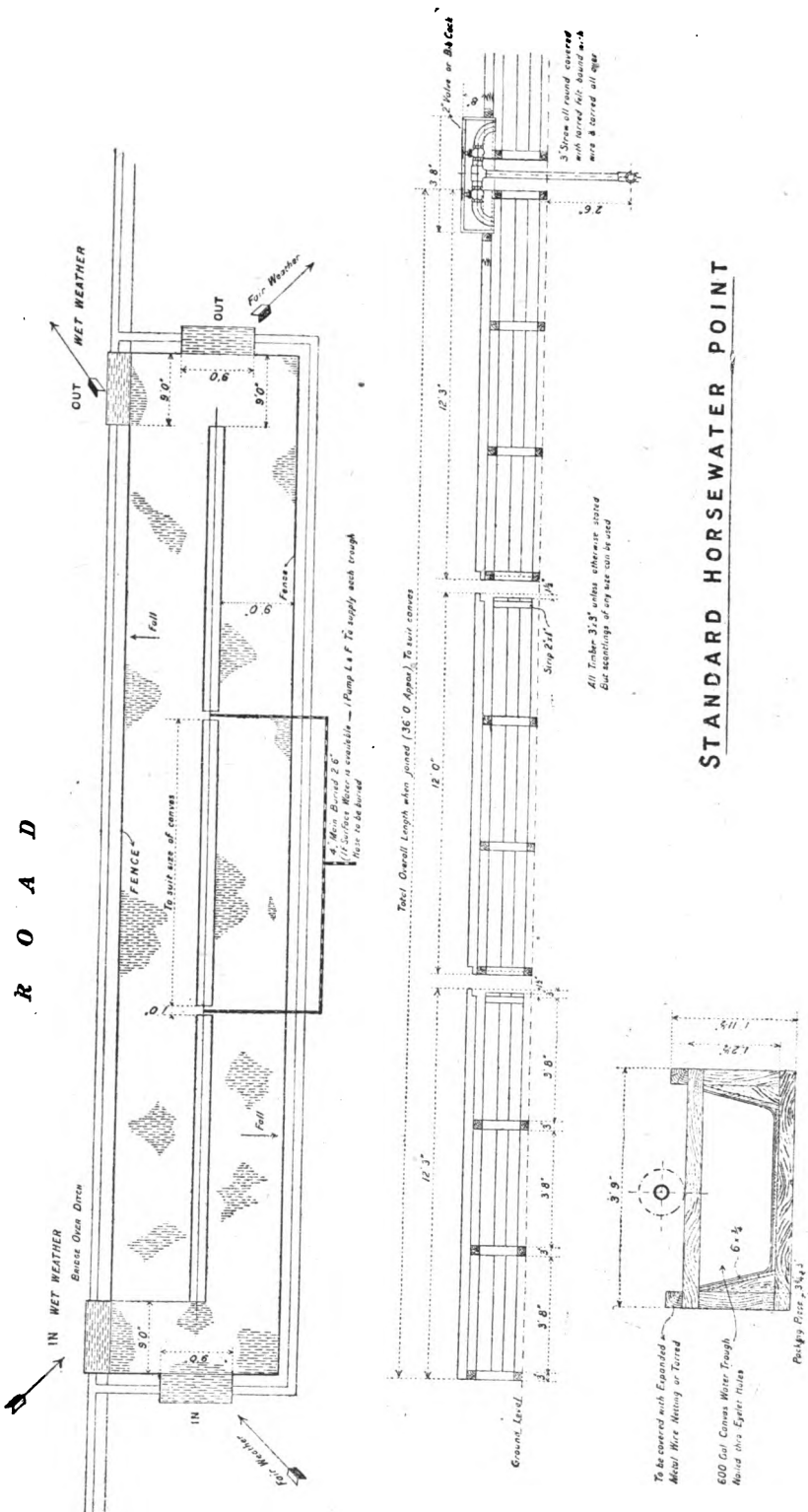
ROAD
IN WET WEATHER
Briese Open Ditch
OUT WET WEATHER
OUT
Fair Weather
FENCE
To suit size of canvas
Fall
Fence
4" Main Buried 2'6"
Lift Surface Water is available — Pump Left To supply each trough
Hose to be buried
STANDARD HORSEWATER POINT
Total Overall Length when joined (36' 0 Approx) To suit canvas
Strip 2"x1"
All Timber 3"x3" unless otherwise stated
But scantlings of any size can be used
Ground Level
To be covered with Expanded Metal Wire Netting or Tarred
600 Gal Canvas Water Trough
Hauled thro Eyelet Holes
Pathway Base 3"x1"

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(2). Considerable storage capacity.

(3). The existing stocks of canvas troughs are made use of instead of diverting corrugated iron sheet from its legitimate uses.

(4). Easy to construct and can be taken to pieces and put up again, and is watertight.

The following points in connection with horsewatering points are usually forgotten :—

(*a*). " IN " and " OUT " Noticeboards, also a Noticeboard lettered as follows :—" DISMOUNT—BITS OUT—AND FILE RIGHT ALONG."

(*b*). A substantial fence all round, made not of barbed wire nor of plain wire but of posts and timber rails. A removable bar which can be used to close up either the fair weather or wet weather entrance as required should be provided.

(*c*). Police arrangements. Noticeboards alone cannot be relied upon. A man with a stick is necessary.

(*d*). Daily R.E. inspection.

And last and most important

(*e*). Ensure a delivery of at least 1,000 gallons per hour when continuous watering is expected.

The design of horse trough reproduced herewith is due to the O.C. of an Army Troop Company, R.E.

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# *REVIEW.*

## PAGES D'HISTOIRE, 1914—1917.

Published by the Librairie Militaire Berger-Levrault, 5—7, Rue des Beaux Arts, Paris.

(*Continued from R.E. Journal for November*, 1917).

The 136th number of this series contains the official communiqués issued by the Central Government to the French Provincial Authorities during the month of May, 1917; it is the XXX. volume dealing with this subject.

The 137th number is entitled *Leurs Buts de Guerre* and consists largely of a collection of extracts from German documents dealing with Germany's War aims. The volume is published under the Editorship of Monsieur G. Pariset, a Professor of the Nancy University, and is issued with a red wrapper on which is printed in bold letters the following explanatory note relating to the contents of the volume: La Paix qu'on nous offre . . . CE QU'ELLE CACHE!

In the five chapters contained in the volume under notice an intense illumination is thrown on the aims which the Teutons had in view when they started the War in 1914, and on the various peace intrigues and counter-intrigues that have been on foot in the German Empire since August, 1914. Chapter I. deals with the German dreams in the early days of the War (1914—1915) and is subdivided into four parts. The first of these parts is headed *Perspectives glorieuses* and contains extracts from German documents which clearly show that, in 1914, Germany, drunk with pride, felt she had a sure thing in hand at the time she rushed into the War; she conjured up visions of a future in which her *Kultur* would displace the ethical codes and spiritual tendencies of other nations, in which her power and influence would be supreme in all terrestrial regions and in which her covetous desires would be amply satisfied.

In an extract quoted from an article entitled *Die Wahren Ursachen des Weltkrieges*, 1914 (The true causes of the World War of 1914), by Lieut. Karl Kuhn, which appeared in No. 10 of the *Aktuelle Bibliothek* (published at the end of August, 1914), the author thereof describes the scenes which occurred when Wilhelm II. addressed a great gathering of his subjects in Berlin shortly after the declaration of War. He tells us that all present felt that they were taking part in one of the most memorable events to be recorded in the History of the World. "It seemed to me," he continues, "that the Goddess of History was opening to us a new and glorious era of marvellous splendour for Germany

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and that the Almighty, pouring down from the high heavens His blessing on the Chieftain of the German Nation, was crying aloud to him : ' Thou hast held the sceptre of peace in thine hands for as long as it has been Mine will that thou shouldst do so, but now that thou hast obeyed Mine call to arms, Oh German Cæsar ! I desire to place on thy Imperial brow the laurels plucked on the fields of battle, symbols of victory and of the most sublime grandeur ! ' "

As another example of German intoxication take the words of Maximilian Harden in the *Zukunft* of the 17th October, 1914. It was he who wrote : " We make War with the solid conviction that Germany can demand and must obtain a larger slice of the world and greater possibilities in the various fields of activity. Kingdoms to which she gave a new life still survive ; others have succumbed owing to their inherent weaknesses. Spain and the Low Countries, Rome and the Hapsburgs, France and Great Britain have, each in their turn, possessed, occupied and colonized great tracts of the richest lands of the world. Now has sounded the hour of the advent of German supremacy. The Treaty of Peace which does not secure this end, will not pay our expenses. . . . When Calais is taken, after the capture of Ostend, I fancy that Germany's War Lord will be able to say to the enemy, pointing to the German troops and fleets in the East and in the West : ' And this is what can be done by German force and German will, now you can see and, in future, you will weigh well the consequences before you attack them. Germany asks nothing more from you, not even a refund of her War expenses ; she is sufficiently indemnified by the holy terror she has struck in your breasts by her Autumn campaign. Should you want anything from us, we will not hesitate to resist your demands even if we have to fight again. We will remain in Belgium, to which we will annex the littoral of France to a point beyond Calais. . . . From Calais to Antwerp, Flanders, Limburg, Brabant, all will be Prussian. . . . The Southern triangle with Alsace-Lorraine and Luxemburg, if the latter wishes, will be constituted into a new province of Lotharingia, a State confederated with the German Empire, under the rule of a Catholic princely dynasty. Then will Germany know why she has poured out so much of her blood.' "

Other extracts are given in this part expressing sentiments very similar to those contained in the above paragraphs.

The second part of the first chapter is entitled *Programme de Victoire*, and gives a bird's eye view of the Germany of the future as depicted by her Professors. The University Professors, Monsieur Pariset reminds us, represent the brain power of Germany. These amiable gentlemen have for many years been proclaiming the hegemony of Germanism in the World. They have adopted Liberty as their battle cry ; the Liberty of the Seas and of the Continents ; a Liberty of the Seas to be secured by *ousting "Albion"* from her present position on the deep waters, for apparently it is her " tyranny " that has prevented German commerce from prospering ; a Liberty of the Continents to be brought about by removing the yoke of Oriental Panslavism and Occidental individualism, in order that all may *freely* enjoy the delights of that *Kultur*—the intellectual gift of Mighty Germany—which will pervade all

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Europe, nay will even be diffused throughout the entire Universe. They have promised to bring about an equipoise between the World Empires (Great Britain and America) and a Germanized Central Europe (extending from the latitude of the North Cape to that of the southernmost point of Italy in one direction, and from the Dnieper in the East to the furthermost point in Western Europe that the power of the sword may put firmly in the Teutonic grasp in the other direction). They have prophesied the spiritual regeneration of the Continent and the creation of a *United States of Europe* under the direction of Germany and under the Presidency of Kaiser Wilhelm II. They have predicted the birth, in the North and in the East, of a Confederation of Vassal States, under the suzerainty of their beloved Fatherland, consisting of the triple Scandinavian Kingdoms with Finland annexed thereto, the Baltic Provinces, a Polish Kingdom carved out of Russian Poland and Roumania with Bessarabia annexed thereto. At the same time, in the West, they have pictured the continued existence, by Germany's kind permission, of France and the Latin Kingdoms; reduced to a state of impotence these countries are to become fields to be exploited by German adventurers of all kinds. Holland and Luxemburg, they tell us, are to be allowed to divide Belgium between them and as a *quid pro quo* must enter the Imperial Confederation.

Having redrawn the map of Europe, as above, these Professors have turned their thoughts to remoter issues; they have sketched out the tempting prospect of a powerful Economic Empire, stretching from the North Sea to the Persian Gulf and including also some of the former Belgian and French Colonies (*vide* article entitled *Krieg und Volkswirtschaft* (War and Social Economics) by Professor H. Herkner, of Berlin University, published in the *Deutsche Reden in schwerer Zeit* for 26th February, 1915); they have described the victorious march of the Turks and of the Mohammedans beyond the Caucasus into the lands bordering the northern shores of the Black Sea as far as the Crimea, for the purpose of bringing about the *emancipation of the Ukraine and the expulsion of the Russians from these regions;* they have pictured the Black Sea and the Eastern waters of the Mediterranean as two German lakes, the latter under an Austro-Greek *régime* and the former under Turco-Persian management; they have recalled the fact that to the War of 1870—1871, which gave them an Emperor and an Empire, was it due that the German people were able to reach the position of splendour and might attained by them in the midsummer of 1914; they have unwisely dared to prophesy that the present War will bring in a still richer harvest and will secure for Germany that position of pre-eminence in the Universe which is her right, by reason of her greatness and of the might of her military and economic forces.

The views to which the German Professors gave expression during the first six months of the War were intended to represent their own individual opinions and not those of any group or class; nevertheless, the sentiments contained therein tally so closely with one another that no injustice would, it is thought, be done in accepting them as the articles of faith of the whole German nation. The nature of these sentiments can be gathered from the following extract from an article

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by the celebrated biologist Haeckel, published in *Das monistische Jahrhundert* for 16th November, 1914 :—

" My own personal opinion is that, from the point of view of the future interests of Germany and at the same time those of the Federated European States, the most desirable results to look for from a (German) victory are :—

" 1. The crushing out of British tyranny.

" 2. The invasion of Great Britain by German forces and the occupation of London.

" 3. The partition of Belgium ; the greater part (*i.e.*, the Western), as far as the line Antwerp-Ostend, must become a Confederate German State ; the north-eastern part should be given to Holland ; the south-eastern part with Luxemburg must also become a Confederate German State.

" 4. Germany must take over a major part of the British Colonies as well as Belgian Congo.

" 5. France must surrender to Germany a part of her N.E. frontier provinces.

" 6. Russia must be weakened by the creation of a Polish Kingdom subject to Austria-Hungary.

" 7. The Germanic portion of the Baltic Provinces must be reincorporated into the German Empire.

" 8. Finland must be constituted an independent kingdom and united to Sweden."

The third part of the first chapter is entitled *L'Europe Sous la Direction Allemande ;* therein we are told that Haeckel is the High Priest of a philosophico-religious sect, with leanings towards " Monism." Monism is only the resuscitated form of an extremely old and out-of-date philosophy very familiar to the ancients ; indeed, it is but " materialism " under a new title. One of the most notorious disciples of monism is Dr. W. Ostwald, of Leipzig University, the well-known chemist. Before the War his name was also familiar to Frenchmen as one holding extreme views on Internationalism and Pacifism. Since the outbreak of the present War he has placed his views on the future of Germanic hegemony on record in an article entitled *Europa unter deutscher Führung* (Europe under German Leadership) written on the 20th August, 1914, and published in the *Monistische Sonntagspredigten* of the 15th September, 1914. In this article Ostwald states that as the nations of Europe have not been able to live together in peace and harmony by common consent, after this War *victorious* Germany will compel them so to live by compulsion. His programme provides in the first place for putting an end to the Naval Supremacy of Great Britain, " the greatest enemy of peace in Europe," once for all. He is of opinion that, after the War, the German Army will be so immeasurably superior to those of Great Britain and all the other Powers that each and all of these Powers will give up the idea of maintaining Armies on their own account, and will instead hand over to Germany the task of protecting them from aggression from the East.

When Ostwald wrote his article he appears to have been confident that the Great War would have but one issue ; in his view, in the same

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way that it was important for the centre of gravity of the military situation in Europe to be located in Germany, so was it equally so that the centre of gravity of the economic situation should also be found in that country. He further opines that the better way of rendering it impossible for any of the Powers to start a War in the future will be for Germany to assume control of the finances rather than the control of the military forces of the world.

Internationalism, which has to all outward appearance been killed by the present conflict, will after the War, says Ostwald, have greater chances, under Germany's direction, of successfully attaining the ends it has been seeking than has ever been the case since its inception.

The fourth part of the first chapter is entitled *Les Conquêtes Futures*, and throws light on some of the schemes of spoliation which have been hatched by the intellectuals of Germany. Dr. Dietrich Schaefer, of Berlin University, was, says Monsieur Pariset, one of the first publicists in Germany to put forward, at the beginning of the War, a scheme of territorial aggrandisement. In an article published in a German Review named the *Panther*, after the gunboat of Agadir fame, Schaefer states most emphatically that it is essential that Germany should strengthen her position permanently in Central Europe. He insists that Germany's power for action should be extended, and particularly so towards the East. As a first step he recommends that Russian territory up to the line of the Dnieper should be absorbed into the German Empire.

He also expresses the opinion that without the destruction of British domination on the seas, and in commerce, there can be no sure peace either for Germany or for the world.

Professor Martin Spahn, of the Strasburg University (a son of Dr. Peter Spahn, Vice-President of the Reichstag), completes the details of the scheme of conquest foreshadowed by Schaefer by making known German designs in Western Europe. He tells us that "it is necessary to reconstitute the frontiers of the ancient great and vast German Empire. Above all else, we must reach the English Channel. After what we have had to endure Belgium must at least cede to us the Congo as ransom; thus will be completed the German Colonial Empire in Central Africa of which we have been modestly dreaming in recent years. Whatever degree of autonomy the Empire may be pleased to concede to the former Southern Provinces of the Low Countries a complete control over them by Germany is essential to her from the political, economic as well as the military point of view. We have occupied Belgium to prevent France from doing so now, it is necessary to continue to occupy this country in order to prevent Great Britain from doing so later. . . . The frontier of France cannot be allowed to remain as at present, but must be marked out further south, where it was, indeed, in the time of Charles V."

Monsieur Pariset points out that at the beginning of the War the German dreams, though optimistic and grandiose, were nevertheless ill-defined; they rested as a pall over the realities of the situation, casting an immense shadow thereon; they pictured the political ideas of Pan-Germanism as a mental attitude; they permitted, however, a

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diagnosis to be made of the nature of the madness that had overtaken the German people. It was also evident that the Government, in order to give the fullest rein to the most extravagant expectations, purposely abstained from giving precise details of their aims. The Imperial Chancellor, addressing the Reichstag on the 2nd December, 1914, stated:—"We will hold out to the end, even until such time that we have assured ourselves that no one will again dare to disturb the Pax Teutonica—a peace worthy of a free people, a peace during the course of which German genius and German power will be able to develop themselves and to prosper at their leisure."

Chapter II. deals with the first of the German peace proposals (in 1915); it is subdivided into four parts. The first part is entitled *Les Mémoires des Six Associations Economiques;* in it we are told that in the Spring of 1915 a strong feeling had grown up in Germany that the War had lasted long enough; it was recognized that the German victory in the West was certainly incomplete; on the other hand it was expected that the Germanic successes against Russia (May to September) might be turned to good account in the West in due time. The German Government, however, does not appear to have shared in the illusions then prevalent on the subject among the German people; the former were in no doubt as to the actual condition of affairs and realized that the Entente Powers were far from having been conquered. The German Government, nevertheless, thought it necessary, in order to satisfy public opinion, to put out feelers in the Entente countries on the question of peace without, however, committing themselves in any way whatever. In order to cope with the difficulties of the situation resort was had to an extremely astute procedure—Machiavelian in its conception. The discussion in public of "War aims" was, in Germany, forbidden. However, certain groups, or Leagues, thought to be competent to deal with the subject, were authorized, or may be even invited, to lay before the Imperial Chancellor proposals in connection with the German peace terms. The publication of these peace terms was not *authorized*, but copies thereof were circulated throughout the Empire. This gave the cue to the Press and created the proper atmosphere in influential circles. Presumably too, suitable arrangements were made for copies of German peace terms to find their way across the border and to become known in foreign countries. The fact remains that the French Press obtained, through Socialist sources *viâ* Switzerland, and was able to publish the text of the Petitions or Memorials presented to the German Government, so that whilst the documents in question remained *quasi* secret and confidential in the country of their origin, they received the widest publicity in the enemy countries.

The two first of the petitions in question were presented to the Imperial Chancellor by six of the most powerful economic and social Associations or Leagues in the German Empire. The first petition is dated the 10th March, 1915; it contains a formula by which the War can, according to the signatories, be brought to an end by "a peace full of honour, worthy of the sacrifices made and carrying with it the guarantee of its permanance."

The signatories to this petition state that the Fatherland's enemies

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are continually announcing that Germany must be crushed and displaced from her position of a Great Power, and they express the opinion that Germany cannot obtain protection merely by signing a Treaty, *since her enemies would pay respect to the terms of a Treaty only so long as it suited them.* They urge that the protection of Germany is to be sought rather *by weakening the economic and military power of her enemies to an extent that will ensure peace for a sufficiently long time.* They continue :—

" We realize that it is by the acquisition of a *Colonial Empire* meeting fully the wide economic interests of Germany, by the imposition of guarantees for the *future of her commerce and customs relations,* by the payment to her of an adequate *War indemnity* (secured in a suitable manner) that the *principal objects* of the conflict, which was forced upon us, can be obtained, and at the same time the security and amelioration, on the *European Continent,* in the position of the German Empire properly provided for, as explained below :—

" Since it is necessary for the purpose of securing our position on the seas and our military and economic future as against Great Britain, since Belgian territory, economically so important, is so closely associated with our principal industrial centres, *Belgium* must, as regards its monetary, financial and postal matters, be subject to the legislative control of the (German) Empire. Her railways and waterways must be closely connected up with the similar means of communication in our own country. By creating a Walloon District and a preponderating Flemish District and by placing in German hands the undertakings and economic properties of importance, from the point of view of the domination of the country, the Government and administration of Belgium can be organized in such a manner that its inhabitants shall not be able to exercise any influence on the political destinies of the German Empire.

" As to France, having regard to our relations with Great Britain, *it is of vital interest to us,* in view of our future on the High Seas, that we should possess the coastal region of France, adjacent to Belgium, approximately up to the line of the Somme ; this will give us access to the Atlantic Ocean. The interior region (which should be annexed at the same time) should have such boundaries that the ports at which the canals end may be made to acquire the fullest importance of which they are capable, economically and strategically. The remaining territorial acquisitions in France, apart from the necessary annexation of the mineral basins of Briey, should be decided upon purely in relation to military considerations affecting strategy. As regards this matter, after the experiences of the present War, it is very natural that we should not wish to expose our frontiers to fresh hostile invasions by leaving in the hands of an adversary the fortresses menacing us, particularly those of Verdun and Belfort, and the Western ramparts of the Vosges, situated between the aforesaid fortresses. By the conquest of the line of the Meuse and the French coast including the outlets of the canals, we should acquire, in addition to the iron deposits of Briey already referred to, the coal regions of the Departments of the Nord and of the Pas de Calais.

" These territorial augmentations will—in the light of the experience

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in Alsace-Lorraine—be so arranged, it is presupposed, that the people in the annexed territories cannot acquire any political influence in matters affecting the destinies of the German Empire and that all the economic resources of these territories, including the properties of medium and large extent, shall pass into German hands; France will be called upon to compensate the owners and to absorb them into her own population.

"The consideration which should weigh with us most as regards the East is to provide there, as a counterweight to the anticipated great *industrial development* in the West, for the annexation of an *agricultural region* of equal weight."

The petition goes on to urge that provision should be made for the founding of Great Agricultural Colonies within the Empire by the repatriation of German peasants residing in foreign lands, notably those living in Russia. It is represented also that some provision is absolutely indispensable for the protection of the frontiers of E. Prussia by extending the confines of the German Empire beyond the present Eastern limits of E. Prussia, Posen and Silesia. These Provinces must not be allowed to remain the Marches of the Empire, exposed to attacks as they are at present. The War indemnity, which Russia should be called upon to contribute, must consist in the cession of territory. It is admitted that the nature and extent of the German demands must depend upon the nature and quality of the military successes gained; the signatories are however confident that "our Army and its leaders will win that victory which will guarantee the attainment of all our War aims."

In one of the concluding paragraphs of the petition it is stated: "The want of direct ports (*i.e.*, in German possession) on the English Channel will inconvenience our maritime trade in the future as it has done in the past. An independent Belgium will always be a British bridgehead and *point d'appui* against us. The existing natural defensive line of France, if allowed to remain in French hands, will be a continual menace to our frontier. If Russia were permitted to come out of this War without loss of territory, she would circumscribe our capacity for action and also our power, whilst, at the same time, the non-acquisition of an agricultural region on our Eastern frontier would militate against the possibility of our adding sufficiently to our population for the purpose of providing the necessary increases to the Military Establishments of Germany in order to make provision for combating Russia."

The Leagues that were responsible for framing the petition from which the above extracts are taken certainly cannot be justly charged with having exhibited any reticence as to what they considered Germany's War aims should be.

The second of the confidential Memorials presented by the Economic Associations referred to was issued from Berlin and bears date 20th May, 1915. In it, after some prefatory remarks, the military and industrial reasons for the annexation of French territory are set out. It is stated that all classes of the German people are united in their intention to wage this War to a definite conclusion, in order that Germany may come

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out stronger than before so far as her *external relations* are concerned, and further, being provided thus with a guarantee of a lasting peace, that she may be in a position to assure her own economic and intellectual development *within her own borders*. The signatories wish for no premature peace; such a peace, they recognize, *would make it impossible for them to hope for a sufficient reward for their victory!* Nor do they want a *weak* peace, a peace which does not provide for the complete political advantage to be derived from the *decisive military successes* to which they are looking forward. The text of the first Memorial is fully incorporated in the second one. It is pointed out that the annexation of the territories containing iron and coal deposits put forward as a War aim in the first Memorial would not only enlarge the industrial power of Germany, but such an annexation, it is urged, is a prime military necessity for the following reasons:—

"The monthly output of pig iron has, in Germany, increased since the month of August, 1914, to about one million tons, that is to say that it has practically doubled. The manufacture of steel has exceeded one million tons per mensem.

"It is necessary to add that there is no great abundance of pig iron and of steel; not only are we in want of it in Germany, but Neutral States are in still greater need thereof than we are. The manufacture of shells gives rise to demands for iron and steel in quantities far greater than ever dreamt of in former times. For cast-iron shells alone which, though of inferior quality, are replacing cast and wrought-steel shells, the consumption of pig iron has, during the past few months, reached at least 4,000 tons *per diem*. Exact figures are not available. But it can be stated that had not the output of pig iron and steel been doubled since the month of August, it is certain that it would have been impossible to continue the War.

"As a material of first importance for the production of the quantities of pig iron and steel required, 'minette' occupies an increasingly important place, for this mineral can alone be extracted in Germany in sufficient quantities to meet the growing consumption of iron and steel."

It is stated that if anything should occur to hinder the output of 'minette' in the Fatherland the War would, to all intents and purposes, be lost so far as Germany was concerned, and it is suggested that if the fortress of Longwy and the numerous furnaces in the French region were to fall back into French hands and long range artillery were to be brought into action at or near Longwy the furnaces in Germany and in Luxemburg would be brought to a standstill in a few hours; the distances from Longwy to Rodange, Diferdange, Esch, Ottange, Rumelange and Dudelange vary from about $4\frac{1}{2}$ miles only to $15\frac{1}{2}$ miles. About 20 per cent. of the pig iron and the steel produced in Germany come from this region. Attention is next drawn to the fact that Jarny (the region of the Phoenix 'minette' mine) is situated at a distance of only 35 kilometres (22 miles) from Verdun, whilst the westernmost mineral deposits of Landres and of Conflams begin at a distance of 26 kilometres ($16\frac{1}{4}$ miles) at most from Verdun. It is significantly pointed out that the Germans have been bombarding Dunkirk at a range of 38 kilometres ($23\frac{3}{4}$ miles) and the question is asked whether anyone in Germany can

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really conceive that, in the next War, the French would neglect to provide themselves with long range artillery and still allow these iron deposits to be worked by Germany ?

Such is the argument advanced for depriving the French of the fortresses of Longwy and of Verdun.

The Memorial proceeds :—" The possession of large quantities of coal, and particularly those coals, rich in bitumen, which abound in the basin of Northern France, is at least as important as the possession of iron ore from the point of view of War requirements."

It is pointed out that the prohibition of the export of coal by the British Government (on the 15th May, 1915) clearly shows that coal supplies can be utilized as a most potent political weapon in an international controversy. Neutral industrial States are bound to obey the behests of those belligerents who are in a position to provide them with the fuel they require.

It is stated in the Memorial that Germany has been obliged to exploit the Belgian coalfields in order to provide against neighbouring Neutral States becoming totally dependant for their supplies of this commodity on Great Britain, and the suggestion is put forward that the systematic use made by Germany of Belgian coal has been the reason that some of her neighbours have continued to remain neutral.

The Memorial also calls attention to the fact the products of distillation in the process of converting coal into coke provide the most important ingredients for the manufacture of explosives and also benzol, which is being used as a substitute for benzine in view of the scarcity of the latter.

The second part of the second chapter is entitled *Le Mémoire des MCD. Sommités*, and contains the text of the most closely reasoned and the most remarkable of the Memorials presented to the Imperial Chancellor ; it was drawn up in Berlin on the 20th June, 1915. The document in question was put into private circulation for the purpose of being signed by leading members of the public. Among those who appended their autographs thereto were Schumacher (of Bonn), Schaefer (of Berlin) and Seeberg (of Berlin). There were finally inscribed on the document nearly 1,400 signatures of distinguished personages ; 352 being those of professors (of higher education), 252 those of artists and men of letters, 182 those of business men and bankers, 158 those of ecclesiastics and professors (of lower education), 148 those of judges and others connected with the law, 145 those of governmental or municipal officers, 52 those of persons connected with agriculture ; some 40 deputies and a number of generals, admirals and diplomatists on the Retired List also attached their signatures to the document. Such then was the constitution of the " *MCD. Sommités* " ; let us now learn what they had to say to the Imperial Chancellor. They make a good beginning ; according to them Germany has never had the intention to increase her territorial possessions in Europe *by conquest ;* she only flew to arms to defend her own *Kultur* and the civilization of Europe against " the barbarians of the East " and " the spirit of revenge and desire for domination cherished by her neighbours of the West." However, they continue : " But to-day a mere defensive attitude is no longer sufficient.

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We wish now to continue our existence in an enlarged territory, established so firmly and so spaciously as to ensure our independence for many generations to come."

They declare that the German people are united in their views as regards what are considered the Essential War Aims; their one fear is lest a premature peace should be concluded. According to them it is not *World domination* for Germany that they demand, rather do they wish to see their Fatherland allowed to occupy in the World that position of importance which is suitable to the magnificence and power of their country's economic and military might. The military achievements of this War, associated as they have been with so many and great sacrifices, must, they urge, be *exploited to the most extreme limits possible.* These *limits* are set out in their Memorial, of which the following is a summary:—

1. *France.*—The French danger must be wiped out; the French menace and cries for revenge have continued from 1815 to 1870, and from 1871 to 1915 France has opposed with the deepest fanaticism every effort at reconciliation made by Germany. In the interests of the continued existence of Germany, France must be reduced to impotence politically and economically—being in no way spared—in order that the military and strategical position of Germany in relation to her Western neighbour may be improved. The distinguished signatories of the Memorial are convinced that *a considerable rectification of the Franco-German frontier, from Belfort to the sea, is absolutely necessary;* the Germans must conquer a part of the French littoral from a point N. of the Straits of Dover and thence westward along the English Channel, in order to secure Germany's strategical position in relation to Great Britain and in order to give her better access to the High Seas.

In order that a situation analogous to the one which has existed in Alsace-Lorraine, for the past four decades and more, may not be repeated in the new territories to be acquired by Germany, all properties and undertakings in anti-German hands must be transferred into the hands of true patriots; the *original owners must be compensated by France.* No political privileges should be accorded to the present population of the annexed territories.

A heavy War indemnity should be imposed on France, without any mercy, in order to teach her a lesson for her blind attachment to Great Britain during the present conflict.

It must not be forgotten that France possesses a Colonial Empire in extent out of all proportion to her own importance; according to the *Sommités*, if Germany does not help herself to them, these Colonies will pass into the hands of Great Britain.

2. *Belgium.*—Belgium having been conquered by the spilling of so much German noble blood, it is necessary for Germany to continue to exercise control over that country politically, militarily and economically, in spite of any reasons that may be urged in opposition to the adoption of this course. German opinion is unanimous that it is a *question of honour* for Germany to retain her hold on Belgium. Otherwise, Belgium will, it is stated, become, politically and militarily, a base for a British attack on Germany.

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Economically Belgium will, it is pointed out, prove a tower of strength to Germany, and her population will, at the same time, be a great military asset, if the Flemish, so akin (it is claimed) to Germans in their culture, will only rid themselves of their artificial Latin wrappings and enshroud themselves in their original Germanism.

The treatment suggested for the present population of Belgium is the same as that proposed in the case of the inhabitants in the French territories to be annexed; they should be granted no political privileges; their properties and undertakings should be transferred to true Germans.

3. *Russia.*—The population of the Russian Empire on Germany's Eastern frontier is increasing according to the *Sommitês*, at the alarming rate of 2½ to 3½ millions a year, so that in a generation 250 million souls would be added to the Russian subjects in this region; this population would constitute a serious danger to the German Eastern flank and be one of the greatest menaces to the future of Germany and to that of Europe. To meet it, a solid rampart against Slavism, it is urged, should be built, and all measures should at the same time be adopted to encourage the increase of German population in this region.

The territories that Russia must be called upon to cede to Germany will form the *rampart and outworks which are to afford the guarantee for the increase of the German population.* It is agricultural lands that Germany wants in this region; *tracts in which a healthy peasant population can be reared, a region which is to act as a necessary counterweight to balance the continuous industrialization and urbanization of the German people,* and to provide, at the same time, Colonies for the surplus population of Germany proper and for those of German descent settled in foreign lands who wish to go back to live under the rule of the Prussian Eagle. These tracts are intended to raise a barrier against emigration and to provide for the better housing of the poorer classes. The colonization and Germanization of these tracts are expected to open up new possibilities of employment to the intellectual amongst the proletariat, and, at the same time, to extend the influence of the German ethical and moral code to the East. The suggestion is put forward that a belt of country beyond the borders of E. Prussia, Posen and Silesia, of a depth determined by strategical considerations, should be annexed and made accessible to German colonization. No private ownership of property should be permitted in this belt; among the subsidiary advantages which it is hoped to derive from this belt is the protection of Prussian Poles, so that they may not be brought under the direct influence of the Russian Poles; it is feared that a situation might otherwise be created which would end in a demand for Polish autonomy.

The proposal is put forward to rob Russia of the Baltic Provinces also. The fertile soil of this region renders it a suitable field of great promise for colonization purposes; whilst its population of Lithuanians, of Letts and of Esthonians, sparse though it be, would serve as the race of itinerary workmen of which Germany is so much in need.

A War indemnity must, it is claimed, also be enacted from Russia, in addition to the foregoing cessions of territory. Russia may not be ble to pay cash down after this War, but she can well pay in kind. Russia is rich in Crown lands and she should, it is urged, be compelled

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to make a grant of such lands, freed from all incumbrances and servitudes, to Germany. This claim, it is suggested, must not be considered as anything out of the ordinary in view of Russian methods of administration; moreover, the Russian people are not so strongly attached to the soil as those of Western and Central Europe.

It is held that to make a peace with Russia which did not result in diminishing the magnitude of the Russian Menace and did not secure territorial conquests, would be to lose the great opportunity for creating a situation tending to favour the rapid political, economic and social recovery of Germany; and thus would postpone to a future date the tussle for a final throw with Russia, *i.e.*, a fresh war for the purpose of securing the existence of Germany and of European civilization would inevitably become necessary.

4. *Great Britain, the East, Colonies and the Distant Seas.*—Although it is principally in the Russian theatre of operations that events, it is pointed out, have been developing so gloriously for the German arms and that measures must still be taken to disperse completely the enormous masses menacing the German Eastern frontier, yet it must not be forgotten for a single moment that, in its ultimate stages, what Germany is in for is a War directed by Great Britain against the former's economic development on the Near Seas as well as on the Distant Seas.

The *motif* of the War and the antagonism of Great Britain, it is urged, indicate what German War aims should be so far as concerns the Island Kingdom. Shortly: in creating a position for Germany in the World there should be secured for her on the Near Seas and on the Distant Seas bases which can be used to the disadvantage of Great Britain.

Germany, it is admitted, has learnt a thing or two by being a blockaded country. Germany must now seek, within her future European territories, more extensive than at present and more effectively protected, an existence free from dependence of any kind on outsiders, particularly so as regards Great Britain and other World Empires which are self-contained. Germany's political friendships with Austria-Hungary and Turkey will throw open to her the Balkans and Asia Minor. German influence must be extended to the Persian Gulf, in order to withdraw Asia Minor and the adjacent regions from the covetous grasp of Great Britain. Commercial relations must be encouraged to the utmost with Germany's political friends.

The opinion is expressed that, in spite of Great Britain's efforts to exclude her, Germany must again take her place as a competitor in the maritime and other commercial concerns of the World. True, many changes will be necessary in Germany's international commercial relations; Germany must be prepared to strike out a course tending to make her independent of other nations, for example, the British intrusion in the money markets must be got rid of, as also British arbitrage contracts and the leading position of British Insurance Companies in matters affecting shipping and transport generally.

The German Colonial Empire must be re-established, but on a sounder and stronger basis. Central Africa will afford a sufficiently wide field for German enterprise. Relations likely to last for many decades must be established with the Islamic World.

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Liberty of the Seas is necessary to Germany. It is because this Liberty will be of benefit to the whole world that Germany is fighting Great Britain. It is in order to attain this end that Germany must in the first place establish herself solidly on the French Coast commanding the Straits of Dover.

The chain of British maritime *points d'appui* which encircle the globe must, it is urged, be got rid of or, as an alternative, their value must be negatived by the acquisition by Germany of an equivalent chain of *points d'appui*. As regards Egypt, it is not only a bond between Britain's possessions in Africa and Asia, but these possessions in conjunction with Australasia practically convert the Indian Ocean into a British lake. Egypt is, as Bismarck long ago pointed out, the nape of the British World Empire. It is her hold on this region that enables Great Britain to impose her arbitrary will on the Western as well as on the Eastern World. It is the spinal cord of Great Britain and it must be snapped. If Germany succeeds in her task, the World's great waterway must be liberated from the domination of a Single Power and the ancient rights of Turkey must be restored to her as far as possible.

The power of Great Britain is stated to be derived essentially from the great influence it exercises at Foreign Courts and on the Press of the whole world. From the German point of view the abolition of the British monopoly in matters affecting cable telegraphy and news agencies is most pressingly necessary.

Germany does not wish, it is claimed, to become a Ruling Power whose object is merely to exploit the world, as Great Britain is alleged to do. She aims, on the contrary, at occupying the position of the foreman or pilot of Europe; a position in which, *after having provided for her own needs*, Germany will respect the Liberty of all other peoples to carry on their own development, and will assure full Liberty to them severally within their own borders.

5. *War Indemnities.*—The demand is advanced for a War indemnity. It is suggested that it should be utilized in connection with the reconstruction of E. Prussia and Alsace, the creation of a Pension Fund for maimed soldiers and the families of those killed in the War, the payment of compensation to individuals for losses out of the ordinary suffered by them, the re-establishment and completion of Germany's armaments.

No sum of money would, it is stated, be too large to exact from Great Britain; it is alleged to be British money that has raised practically the whole world against Germany.

But it is France that must in the first place, if not exclusively, make a monetary contribution as a War indemnity No sentiments of false pity must be allowed in any way to weigh in the balance; the heaviest possible financial burden must be placed on France.

The signatories in conclusion explain that should they be reproached, owing to the circumstance that many of them are associated with Science, Art and the Church, for putting forward claims in which questions of political, economic and social power occupy the field to the exclusion of the purely intellectual duties of Germany, they have a threefold reply:—

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(i.). Solicitude for the intellectual activities of Germany has nothing to do with War aims and peace conditions.

(ii.). If, however, they are really called upon to say a word on matters affecting intellectual activities, then they would point out that Germany must first be assured of her political and economic existence before she can be free to devote herself to the task of promoting intellectual progress.

(iii.). To those who wish for some kind of intellectual progress divested from the politics of power, that is to say for something in the nature of pure intellectual progress, they would say that Germany has no desire for that form of intellectual progress, one in danger of suffering decay, since this is the kind of progress which is without roots and would falsify the character of the German people, whereas they (the signatories) have put forward claims intended to build up the intellectual progress of Germany on a sound and healthy basis. With Bismarck they would say, "If there is any situation in which faith is capable of moving mountains and in which it is evident that courage and victory do not represent cause and effect, but are one and the same thing, that is the one where politics come into play."

The third part of the second chapter is entitled *Considérants des Mémoires* and contains a justification, by Professor Hermann Schumacher, of Bonn University, of the proposals contained in the Memorial of the *Sommités* to which the preceding part of this chapter is devoted. Professor Schumacker is a much-travelled man; enjoying high distinction, his views carried great weight before the War. The present German Crown Prince was one of his pupils at Bonn, During the War the advice which he has given his Government has not been happy; he has been very much astray in his premises regarding matters connected with the War. The following are some of his recorded views:—

*Belgium.*—"We have need of Belgium in order to protect Germany against Great Britain and in order to protect the World and Colonial trade of Germany. The possession of Belgium will at a later date facilitate the attack by Germany on Great Britain. Since the latter kingdom is an island, we can only attack it with difficulty from land, but Great Britain is vulnerable on the sea. If we station at Zeebrugge or further west, at the entrance to the English Channel, squadrons of submarines, of destroyers and of aeroplanes, we shall also acquire something akin to that insular power that Great Britain monopolizes."

The Professor then proceeds to recommend that Belgium and Luxemburg should be hedged in by a Customs barrier, so that Germany may not suffer from any commercial policy that may be inaugurated in Belgium; that Germany should retain a strong hold on the Belgian railway system so as to prevent commercial competition between Belgians and Germans; that the social laws of Germany should be brought into force in Belgium; that the internal affairs of Belgium should be managed separately from those of Germany, but under a parliamentary *régime* similar to that of the Fatherland.

"It is by the *régime* instituted in Belgium," he tells his countrymen, "that we shall fortify ourselves against Great Britain and not otherwise."

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*England and Colonies.*—Professor Schumacher opines that "the issues of the War, so far as Colonies are concerned, rests on the control of the great maritime route which, skirting the British coast, traverses the Mediterranean, the Suez Canal, and the Red Sea, whence tracks radiate towards India, Australia, the Far East, rather than in the Colonial possessions themselves." He complains that Great Britain maintains her commercial supremacy by dominating this great commercial highway along which she has posted her sentinels. He admits that it will be a difficult task for Germany to oust Great Britain from her position, but the preparation of schemes to attain this end must nevertheless not be neglected. When certain French, Italian and Turkish ports are in German hands, the time will have arrived to deal with British commercial supremacy and to bring about a measure of equality in this respect between the several Powers.

*France.*—"All our Western frontier, from south to north," says Professor Schumacher, "must be improved as much as circumstances will allow. It is none the less necessary to take care of those industries which are connected with the preparation for war. Above all things, we must make sure of getting hold of all materials which are a prime necessity in connection with the manufacture of munitions and to deprive our enemies of the same." It is pointed out that, thanks to the 1870 War, Lorraine, with its mineral wealth, passed into German hands. However, the geologists consulted by Bismarck had not exact information regarding the stratification of the old frontier region and in consequence the Longwy Basin, one of the richest parts of France, was allowed to remain in French hands. Professor Schumacher continues: "Today, we can correct this mistake, for we have been in occupation of this mining region since the beginning of the War and still hold it firmly in our hands."

Turning to another aspect of the situation, it is pointed out that coal is the second material of prime importance in connection with the manufacture of munitions. On this ground, Professor Schumacher urges that the coal regions of Belgium and of Northern France should be annexed by Germany; "to give back to the enemy these sources of military and economic power, which the sword has put in our hands, would be," he says, "an act opposed to the vital interests of our people, as affecting the situation both in times of war as those of peace."

Since the Professor's views on the general German War aims correspond so closely in matters connected with territorial acquisitions with those contained in the Memorials of the six Associations or Leagues and of the 1,400 distinguished leaders of the learned callings referred to earlier, it is perhaps not surprising that in the matter of the War indemnity to be exacted in hard cash from France he too should urge that Germany should not hesitate in putting in a demand in this respect up to the *extreme limit.*

Schumacher's views, of which the above are but a summary, have been published in the *Berner Tagwacht;* a French translation of the text appeared in *Le Temps*, 28th August, 1915.

The fourth part of the second chapter is entitled *Déclaration des Partis Bourgeois* and sets out the views of the German middle classes which,

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although divided as regards their political creeds, are, nevertheless, united on the subject of War aims. They express themselves as full of admiration, of joy and of gratitude to the German troops and their Allies, in that they have safeguarded Germany from the trials of an invasion by their victorious and uninterupted march far into the interior of the enemy's countries. They tell us that they are waiting with quiet resolution, and with confidence in the Almighty, for the day on which peace negotiations will lead to guarantees being provided for the protection of the military, economic, financial and political interests of Germany on a lasting and widespread basis, *including therein the necessary increases of territory.*

W. A. J. O'MEARA.

[The Review of the remaining Chapters of the number are held over for want of space.—ED., *R.E.J.*]

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# NOTICES OF MAGAZINES.

## *REVUE MILITAIRE SUISSE.*

*No. 7.—July*, 1917.

THE ITALO-AUSTRIAN THEATRE OF OPERATIONS (*continued*).

The text is accompanied by reproductions of photographic views of military interest, and by a sketch map showing the Austrian defences on the Carso, E. of the Vallone.

During the spring of 1917, it was on the Monfalcone-Gorizia front that the most important of the Italian battles were fought. The Italian right rested at that time on the Lisert Marshes (situated S.E. of Monfalcone, near the borders of the Adriatic); it extended northwards along the heights E. of Pietra Rossa-Mount Debeli to a point W. of Oppacchia, and thence by Vertoiba, where a marked re-entrant occurred, and Hill 174 to a point E. of Gorizia. From the last-named place, the Italian front ran along the right bank of the Isonzo to a point S. of Plava, which was in Italian hands, where it crossed to the left bank of the river.

At many points the enemy held positions commanding the Italian line, whence they could bring enfilade fire to bear along them. The Comen plateau E. of Castagnevizza is a particularly difficult region in which to carry on war; it is bordered on its south by the formidable position of the Hermada. Troops operating on the plateau have their northern flank exposed to attacks from the north and run the risk of being driven into the sea. The Austrians had had ample time given them in which to entrench themselves, and they took full advantage of this respite to strengthen their positions; these were naturally formidable.

The country round Gorizia is commanded by the positions of S. Gabriele and Monte Santo. The general configuration of the country was such as to give the Austrians an advantage and for this reason surprise has been expressed, in some quarters, that they did not play the *rôle* of attackers, instead of leaving it to the Italians. However, it has to be remembered that an Austrian offensive undertaken in the Isonzo region alone would easily have been checked by the Italians. On the other hand, the re-capture of Gorizia by the Austrians would undoubtedly have had an exceedingly good effect, and would, at the same time, have enormously raised the *morale* of the victorious troops.

At the northern extremity of the Sector, hills, of which Monte Cucco is the centre, rise as a rampart to the Isonzo. On a front of about 4,000 yards, the steep slopes descend abruptly to the river; some 1,500 feet below the hilltops.

The Italians continued to hold on to Plava, under difficult conditions,

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and under effective artillery fire from commanding positions. The situation was such that if the Italians could but obtain possession of the region E. of the Cucco, they would thereby paralyze any effort the Austrians might make to take the offensive. It was unfortunate for the Italians that the bridgehead of Plava was at the bottom of the valley; since this deprived their offensive of close support from their artillery. Nevertheless, the possession of Plava by the Italians was a distinct menace to the Austrians, being a wedge driven into their defensive system.

During the winter there had been a cessation of active hostilities. This period of calm had been utilized by the Italians in completing their arrangements for the coming offensive. Large parties had been employed by them in constructing roads for the artillery, tunnelling, etc.

The Italian offensive on the Isonzo was opened by their artillery on the morning of 12th May last; it kept up a continuous bombardment for 50 hours on a front of some 30 miles. Two days later an infantry brigade moved to the attack, at midday, in the Plava Sector, to the north of the Cucco, whilst another infantry brigade advanced on its right by Zagora, sending one battalion forward against the Zagomila position; the attacks of these troops met with success. On the 15th *idem* the crest of the Cucco was in the possession of the Italians, and three days later the Vodice also fell into their hands. The Austrian counter-attacks which followed failed to drive the Italians out of the captured positions.

To the north of this Sector the Italians crossed the Isonzo between Canale and Auzza and established themselves on the left bank of the river, thus protecting their own left flank. The battle now extended as far as the crest of the M. Santo, on which the Italians succeeded in gaining a temporary footing.

To the E. of Gorizia, a third brigade attacked Hill 174, and obtained possession of it; the frontal movement was thus extended in width and at the same time a further step was taken towards the envelopment of the Gabriele-Santo front from the south.

The main features of these operations were the successful passage of the river, under most unpromising conditions; the carrying of the Cucco by assault; and finally, the repulse of the enemy's counter-attacks. It was a great feat on the part of the Italian troops to have carried, in so short a time, these positions, which had been in the enemy's possession for the past two years.

At 2.30 p.m. on the 15th *idem*, the Italians bridged the river near Bodrez. The details concerning this operation are not available at the present time; it would appear that it was carried out with the object of turning the flank of the Austrians who had either been brought into action, or were about to be so brought, in the zone of the Cucco. The Italians, having effected their purpose, the detachment so employed retired across the river, in the face of forces very superior in strength to itself, and re-occupied its previous position. This detachment succeeded in bringing back about a hundred prisoners.

During this period the Austrians attempted a diversion in the Trentino, exhibiting considerable activity at many points, *e.g.* the Judicaries, the Val Arsa, the Val Posina, the Val Astico, the Asiago Plateau and the

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Val Sugana. The Italians were not to be thus deceived. There was fighting also on the Pasubio region.

On the 23rd *idem*, on the eve of the anniversary of the declaration of war between Italy and Austria, the Italians took the offensive on the front between the sea and the Frigido. The Austrians were estimated to have 100,000 rifles on this front. The artillery bombardment only lasted 10 hours. The attack was delivered against the Austrian centre (Jamiano-Flondar) and left. Ten British batteries of medium guns and the Italian fleet participated in this attack. A great aerial fight also took place, in which 130 machines of various kinds took part. In the centre, the Italians penetrated the Austrian defences as far as the line Jamiano-Lucati. Boscomalo was surrounded and fell into Italian hands, in spite of the formidable nature of its defences. On the extreme right, the Italians advanced beyond the outskirts of Monfalcone and captured Hill 21. On the 24th *idem*, the Italians made a vigorous push and penetrated the Austrian position as far as Versic and Flondar. On the following day, the Italians passed beyond Flondar and threatened S. Giovanni at the foot of the Hermada. On the 26th *idem*, the crest of the Medeazza was threatened and the Italians captured Hill 145. By the 27th *idem*, the Italians had reached approximately the line S. Giovanni-Castagnavizza.

During the 15 days that the battle raged, the Italians claim to have captured 23,681 prisoners, including 604 officers, also 36 guns and 148 machine guns. Although the Italian success was not decisive, it brought them a step nearer their objective.

The Austrian counter-offensive, which had been prepared behind the line of the Hermada and Terstel terraces, was launched on the 24th May. At this time the Italians were threatening Hermada and were barring all the routes into the Vallone.

The Italian operations followed, in their general outline, the plan which had been adopted by them in 1916, and which had given them the Carso and Gorizia.

## NOTES ON MACHINE-GUN FIRE.

### *Traversing Fire.*

The author of the original article points out that in the case of machine-guns apart from the fire with both clamps firmly tightened up, known in Germany as *Punktfeuer*, which is used for the purpose of adjusting or verifying the setting of the sights, or against a small target, all other forms of machine-gun fire are really *traversing fire*. According to his definition whether the gun is traversed horizontally, vertically or diagonally, or whether a certain zone in depth or a certain zone in width is brought under fire, these all constitute *traversing fire*.

The original article enters into certain details in connection with the methods of handling the machine-gun used in Switzerland; no particulars of the gun itself, however, are given. It is stated that all are agreed as to the method to be employed in the cases of horizontal and vertical *traversing fire*, viz.:—One clamp must be tightened up whilst the other is left just *sticky*. There are, however, four methods, it is suggested, of dealing with the problem of *diagonal fire*, each having its own partisans; these methods are as follows:—

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1. A series of grouped shots or the so-called "searching in echelon." By this method of fire the advantages possessed by the machine-gun as an automatic weapon are largely lost. The material damage done by a machine-gun by this method of fire is no more than that which a few good rifle shots can produce; whilst, so far as moral effect is concerned, the advantage appears to be with the riflemen.

2. Fire from a diagonally placed tripod so that the whole target can be covered without change of elevation. This method gives very good results, but can only be used for a fixed range, having a uniform slope.

3. Fire with both the traversing and elevating clamps *sticky*. In this method both hands are continuously required for manœuvring the gun on its tripod and the firing trigger is worked by the right thumb. This method presents many difficulties and great skill is required to produce good results.

4. Fire with the clamps loosened. Both hands are employed in this method for directing the gun on to the target in a manner similar to that required in handling a punt-gun. The author of the original article states that he has never seen this method taught; the view seems to prevail that in handling a machine-gun in this way the vibration is too great to enable the gun-layer to keep his weapon steadily trained on to the target. His own experience goes to prove that this method is preferable to the three preceding ones mentioned by him. In order to obtain good results by this method it is alone necessary to see that the tripod is firmly fixed in the ground and to make sure that the firer has good supports for his elbows; the latter requirement is essential.

In the case of *traversing fire* on a wide and deep zone, methods also differ. The first method consists in searching laterally, step by step, along the whole front, using a different elevation at each successive step. Good results can be obtained by this method, if sufficient time is available.

The second method also consists in searching laterally, the right hand being utilized for swinging the gun horizontally, whilst the left hand is used to work the elevating wheel, in such a manner as to cause the muzzle of the gun to sweep out the infinity sign (∞) in space during a complete traverse from the central position; good results can be obtained, but the method is not recommended.

In the case of this kind of *traversing fire* the author of the original article also expresses a preference for the punt-gun method of handling the machine-gun. This method possesses, in his opinion, advantages too where the target is a column of troops on the march and where it consists of troops drawn up échelon-wise.

## The Russian Campaigns of 1914—1916.

The author of the original states that his principal sources of information are drawn from the *International Military Digest* and the *Journal of the U.S.I. of India* (article entitled *Twelve Months of the War on the Eastern Front*).

In the first days of August, 1914, Russia concentrated on her western frontier some 1,500,000 men, one-third along the Prussian portion of this frontier and the remainder along the Galician frontier. Austria had about a million men in Galicia, so that the opposing forces were

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about equal on this section of the frontier. On the northern portion of this frontier the Russians had an overwhelming superiority and yet whilst they were beaten hollow on the Prussian frontier, they nevertheless won a decisive success against the Austrians.

The Germano-Austrian plan of campaign provided for a knock-out blow being struck, in the first instance, against France, and in consequence very few German troops were left in Eastern Prussia. To meet this situation, it was intended that the Austrians should create a diversion by launching an offensive against Warsaw from the south; it was hoped that this would draw the Russian reserves to this region. Had France been disposed of as easily as was hoped would be the case, the next move of the Germans would have been to strike a decisive blow at the Russian troops in Poland.

The intentions of the Russian General Staff are still obscure. They seem to have planned a simultaneous invasion of Prussia and of Galicia. It is difficult to say whether Vienna or Berlin was the first objective assigned to the Russian Armies, or whether both of these places were, or whether neither of them was. It would appear that the intention was to occupy as much enemy territory as possible S. and N. of the Poland Salient, in order to rectify the frontier and to have as wide a front as possible from which to operate according to the developments of the situation. The troops mobilized on the Russian western frontier were not sufficient in numbers to carry on a vigorous offensive against both enemies.

The author of the original paper expresses the opinion that Russia's best course, at the beginning of the War, would have been to remain content to observe the small German Army in Prussia only, which was at that time incapable of operating at a distance from the Prussian frontier, with two or three Army Corps. Had she done so, an additional 300,000 to 400,000 men would have been released for operations against the Austrians, who might have been decisively beaten before assistance could be given them by the withdrawal of German troops from the Belgian theatre of operations.

The million Austrian troops in Galicia were organized in three Armies of about equal size, viz.:—

The II. Army (Auffenberg) was on the extreme right, E. of Lemberg and faced E.N.E.

The I. Army (Dankl) was at Przemysl, in the centre and faced N.

The III. Army (Archduke Joseph Ferdinand) was on the left, near Cracow, and faced N.E.

On the 10th August, 1914, the two latter opened an offensive campaign simultaneously; the I. Army moved along the right bank of the Vistula, on Cholm-Lublin, the III. Army along the left bank of the same river, on Sandomir-Kielce. The latter Army was, owing to the configuration of the frontier, several marches in rear of the former. The II. Army remained on the defensive. The Russian troops S. of Warsaw were also organized in three Armies of about equal size.

The 1st Army (Ivanoff) was on the right, on the line Lublin-Cholm, facing S.

The 2nd Army (Roussky) was in the centre, based on Dubno, facing W.S.W.

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The 3rd Army (Broussiloff) was on the left, E. of Tarnopol, facing W. The Poland Salient was practically unoccupied. The brunt of the first attacks was borne by Ivanoff's Army; it held its ground.

On the 22nd August, 1914, when the Austrian offensive was still very far from its first objectives, the Russian 2nd and 3rd Armies simultaneously struck a vigorous blow at Auffenberg's Army, which recoiled under the shock.

Between the 27th August and 2nd September severe fighting was in progress on the line of the Gnita Lipa, between Busk and Halicz. Auffenberg's right wing was driven back near Halicz, and retired in disorder to positions behind the line of the Dniester, losing 70,000 prisoners and 200 guns.

The main body of Auffenberg's Army, which was now in danger of being cut off from the south, was obliged to evacuate Lemberg. It was reinforced by troops withdrawn hastily from the III. Army, and offered, during the first half of September, a stubborn resistance on the line Grodek-Rawurska.

At the same time, Ivanoff assumed the offensive and slowly pushed back Dankl towards the south. From the 15th September, the Austrian retreat became general. Eight days later, Przemysl was invested by the Russian 2nd and 3rd Armies, whilst Ivanoff pushed in further westward until he reached the line of the Wisloka. The Austrians were driven back on to the Carpathians and on to Cracow. In spite of the relative weakness of the Russian forces, their offensive in Galicia was brilliantly successful.

In E. Prussia, the Russians set in motion two armies, each 250,000 strong; the Army of the Niemen (Rennenkampf), which was near Kovno, facing W.; the Army of the Narew (Samsonoff), which was between Ossowiecz and Warsaw, facing N.W.

Simultaneously with the Russian attack in Galicia, the Armies of the Niemen and Narew invaded E. Prussia concentrically.

Hindenburg, with only four German Army Corps, opposed half a million Russians. By clever manœuvres, similar to those of Napoleon in 1814, he penetrated between the two hostile armies and beat them successively.

From the 26th to 30th August, Samsonoff, who had become entangled in a region cut up with lakes and marshes, suffered successive checks in the Tannenberg District and was decisively beaten If German reports are to be relied upon, 90,000 Russians were taken prisoners at Tannenberg. Having beaten the Army of the Narew, Hindenburg turned against the Army of the Niemen, which had reached the Friedland-Angerburg region. Rennenkampf, avoiding a decisive action, retired in great disorder on to the Niemen, leaving large numbers of prisoners and about a hundred guns in German hands.

At a time when the Russians were investing Przemysl, the remnants of their Northern Group of Armies were seeking shelter behind the Niemen and the Narew.

Whether it was due to incapacity, carelessness or treason is not clear, but the fact remains the Russian offensive in E. Prussia, which from outward appearances had every prospect of success, failed miserably.

The Russians attempted later to explain away their failure in E.

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Prussia, by attributing to their operations the character of a raid on a large scale ; this explanation can, however, deceive no one.

In spite of this check, the Russian operations in August and September, 1914, were on the whole successful. Their principal Armies had defeated the principal Austrian Armies and had conquered nearly the whole of Galicia. Hindenburg had not been able to follow up his success ; he had attempted to cross the Niemen on the 25th and 26th August, near Rodno, but the Russians had had no difficulty in checking him.

Towards the end of August, either in accordance with a premeditated plan, or because of bad news from Galicia, or by reason of over-elation at their victories in Lorraine and in Belgium, the Germans began to push fresh troops into their Eastern theatre of operations. These troops arrived too late to prevent the Austrian *débâcle*, but early enough to have their revenge. Towards the end of September, nearly a million Austro-Germans had been collected on the front Thorn-Cracow, having on their flanks Hindenburg's original Army in E. Prussia and the remnants of the Austrian I. and II. Armies in the Carpathians.

On the 28th September, two German Armies invaded Poland ; one marched *viâ* Lodz on Warsaw, the other *viâ* Kielce against Ivangorod. According to the German reports the Army on the left consisted of five Army Corps, that on the right of seven Army Corps. In rear of these two Armies great numbers of troops were being collected on the line Cracow-Thorn.

The Russians were to some extent unprepared for meeting the German offensive, and had temporarily to fall back on to the defensive. Had they not carelessly sacrificed so large a part of their force in E. Prussia, they might have had sufficient reserves in hand not only to continue their offensive in Galicia, but also to ward off the German blow against Warsaw.

The thrust of the German Army of the North carried the Teutons beyond Lodz and they were not brought to a halt till the 20th October, when they were but half-a-day's march from Warsaw. The Germans had, however, to retrace their steps to the frontier, since the Russian cavalry now succeeded in penetrating into E. Prussia N. of Kalisch. The Austro-German Southern Army, starting from the region to the N. of Cracow, rapidly reached the neighbourhood of Sandomir and Ivangorod, but was unable to cross the Vistula. Towards the end of October, it also had to retrace its steps to a point W. of Kielce.

To meet this German offensive, the Russians had been obliged practically to evacuate Galicia. The Austrians at Cracow and in the Carpathians having assumed the offensive, the Siege of Przemysl was raised. The main object of the German offensive may have been to achieve this end.

In November, the Germans again took the offensive. This time, the stroke was delivered from the region of Thorn, where 12 Army Corps had been collected under Mackensen. Their objective was Warsaw.

The Russians appear at this time to have intended to launch a big offensive themselves from W. Poland against Thorn and Breslau. However, the Germans had stolen a march on them. After alternating successes and failures, the Russians had eventually to evacuate Lodz (6th December). At the end of December, they were back on the

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Rawka and the Lower Bzura, a day's march from Warsaw; they held on to these positions till July, 1915.

The Germans had not yet succeeded in definitely smashing the Russian offensive.

Whilst Mackensen was frittering away his forces at Warsaw, new Russian Armies had once more invaded Galicia, reinvested Przemysl, occupied several passes in the Carpathians, and conquered Bukovina. They were also threatening both Cracow and Hungary.

After a desperate effort the Austrians succeeded, during December, in regaining the Carpathians and in temporarily removing the danger of an invasion of Hungary.

At the end of 1914, the advantage still remained with the Russians, who still held the majority of the passes in the Carpathians, and were therefore in a position, when the climatic conditions would allow, to debouch either into Silesia or into Hungary; they had also checked all enemy attempts against Warsaw, Grodno and Kovno.

In January, 1915, the Russians made considerable progress on both wings; in the N. of Poland towards Mlava, and in S. of the Bukovina as far as Kimpolung and Kirlibaba.

At this time the Austro-Germans had 50 Army Corps on the Russian front; approximately 12 of them in E. Prussia, about the same number in Poland and the remainder in W. Galicia and on the Hungarian frontier.

In the depth of winter (23rd January), the Austro-Germans in Galicia and in Hungary made a vigorous effort to reconquer the Carpathian passes and to relieve Przemysl. With their right they succeeded, after hard fighting, in regaining, towards the end of February, the whole of the Bukovina and in reaching the Dniester. In the early days of March, the Austrian advance in this sector was brought to a halt by a vigorous Russian counter-offensive. During this time, the Austrian Centre and Left, after a few initial successes, exhausted themselves in vain efforts to debouch from the Carpathians into the Galician plain. Przemysl, with its garrison of 120,000 men, capitulated on the 22nd March. Simultaneously with the Austrian offensive, the Germans attacked W. of Warsaw, but without success.

To the N. of the Vistula in the region of Prasnitz and of Malava, fighting had continued during February and part of March. Finally, the Germans had retired on to their own frontier.

On the whole the situation seemed to be still favourable to the Russians, but a storm was brewing where least expected.

The Austro-German offensive of February was probably undertaken with the object of raising the Siege of Przemysl and of effecting the capture of Warsaw; it is quite possible that these were subsidiary operations intended to mask the main offensive, which was being, at the date in question, prepared E. of Cracow for the purpose of obtaining a decisive result.

The Russians now made another attempt to reach the plains of Hungary. Between the 19th March and 21st April, 1915, violent encounters took place at the Passes of Dukla, Lupkow and Uzsok. The Russians had local successes, took prisoners, but were unable to break through the mountain barrier; it is possible that they wished only to strengthen their positions but not to leave the mountain fastnesses. The

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enemy, however, were much alive and on the 2nd May, after a three days' bombardment of unheard-of intensity, the Austro-Germans pierced the Russian positions on the Dunajec, E. of Cracow. Following up their successes they recaptured, one by one, the passes in the Carpathians, next Przemysl, then Lemberg, and pushed back the Russians almost to the positions occupied by them during the first days of the War.

At the end of April, the Austro-Germans had nearly two million men on the Russian front. Of these, about one million were echeloned from the shores of the Baltic to the N. of Cracow; the remainder were in the Cracow region, in the Carpathians and in the Bukovina. The million men last referred to were organized into five armies:—

The IV. Austrian Army (Archduke Joseph Ferdinand) and the XI. German Army (Mackensen), totalling some half million men, were extended on a 50-mile front E. of Cracow and faced E.

The III. and II. Austrian Armies (Borœvic and Boehm-Ermolli) and the German Army of the South (Linsingen) were in the Carpathians, and faced N.N.E.

A sixth Army (Austrian) under Pflanzer was in the Bukovina.

The Russians in this region were at this time disposed as follows:—

The 3rd Army (Radko Dimitrieff) near Cracow; the 8th and 9th Armies in the Carpathians and the Bukovina.

The group of Armies under Ivanoff comprised 14 Army Corps (some 500,000 to 600,000 men), of which about one-third were on the Dunajec.

The Germans it will be seen had succeeded in establishing the main condition for securing success, a superiority of numbers at the decisive point. They also possessed superiority in the matter of artillery and supplies of all sorts.

The 3rd Russian Army was attacked simultaneously by the Archduke Ferdinand and Mackensen; being outnumbered in the proportion of 2 to 1, it was unable to parry the blow. At the very beginning of the attacks Mackensen pierced the Russian line at Gorlice. For a whole week the Russians were able to fall back from one river line to another, approximately parallel to it, without becoming seriously broken up. But the Austro-German pressure in the Carpathians now began to make itself felt, and the Russians thereupon accelerated their retirement, drawing into the movement their troops, which were at that time N. of the Vistula. One after the other the passes in the Carpathians fell into the hands of the Austro-German troops. The Russian left was being continually threatened, and it was thus compelled to retire continuously. On the 3rd June, one month after the opening of the offensive, the Austrians re-entered Przemysl; three weeks later they reached Lemberg. It was on the Austrian right wing only that little progress was made, Pflanzer remained on the right bank of the Dniester, to the N. of Czernowitz. The Russian line from being convex to the enemy had become markedly concave. At the end of June, it ran along the Dniester and Zlota-Lipa, *viâ* Sokal, to Josefow, where it crossed the Vistula and connected up to the E. of Ivangorod with the Russian front in W. Poland, which had remained stationary on the Rawka-Busra.

During the early days of July the Russians drove the Archduke Ferdinand back from Lublin on to Krasnik.

On the 11th July, the campaign in Galicia came to an end, but the

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Austro-German offensive continued. The object of the Central Powers was now nothing less than the conquest of Poland, Podolia, Wolhynia, Lithuania and Courland. They wished to exploit their success in such a manner as to wipe the Russian Armies out of their reckoning for many months to come. They had, however, now to deal with an additional enemy; Italy had declared war on the 23rd May.

Even before the big offensive in Galicia, the Germans had boldly pushed into Courland (end of April). They had reached Libau and threatened Mittau, but towards the middle of May they had been obliged to withdraw their forces to some extent; Libau, however, remained in their possession.

At the time when Mackensen's offensive had come temporarily to a halt near Lemberg, Hindenburg made a thrust, with considerable forces, on the whole front Libau-Ivangorod. A few days later Mackensen also moved forward.

The Russians were driven back from the Narew and then from the Rawka-Busra. On the 28th July, the German Army under Von Woyrsch forced the passage of the Vistula between Warsaw and Ivangorod. The Russians evacuated Lublin on the 31st July and Warsaw on the 5th August.

At the same time, the Germans threatened Riga by land and by water. On the 2nd August, they occupied Mittau; the German Fleet, however, cleared from the Gulf of Riga on the 20th August, after having suffered heavy losses.

Further south the German advance continued, but without the attainment of the end sought. The Russians retired slowly, with heavy losses; at the same time, however, inflicting considerable casualties on the enemy.

The Germans captured the fortress of Novo-Georgievsk on the 20th August, six days later they occupied Brest-Litowsk and Grodno on the 2nd September.

At the beginning of September the Archduke Nicholas was transferred to the Caucasus and the Czar personally assumed the functions of Generalissimo on the Russian Western Front, whilst Roussky remained in command of the Northern Sector.

From this time, the Russian thrusts became increasingly more intense, particularly in the Southern Sector. On the 7th September, the Russians delivered a strong offensive stroke in Galicia, capturing 20,000 prisoners in a few days.

The Germans fell back on the defensive on the Southern Sector, whilst continuing their offensive with very large forces in the Northern Sector. Their object seems to have been to break through the Russian front and to envelope the divided portions of the enemy's Army. They, however, failed to attain their ends. Their attacks failed both in the Riga region as well as at Dwinsk. Further south, they captured Vilna and Pinsk, but at a great sacrifice. The Russians claim to have taken 50,000 Austrians and Germans prisoners during the month of October.

At the end of 1915, the German offensive came definitely to an end. The Russians now attacked in their turn in the Bukovina, then on the Styr and in the Pinsk region. They made ground here and there, but they were not able to pierce the Austro-German line. During the

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early days of 1916 nothing important happened ; the Austrians, however, lost the bridge-head of Uscievzko, on the Dniester.

On the 4th June, the Russians suddenly and unexpectedly launched a strong offensive along the southern part of their front, from the Pripet Marshes to the Roumanian frontier ; at this time the Germans were firmly held in the Franco-Belgian front and the Austrians on the Trentino front. Broussiloff was in command and all went well at first.

The fortress of Lutzsk was recaptured on the 6th June, that of Dubno on the 10th *idem* ; 35,000 prisoners also being taken. Czernowitz fell to the Russians on the 17th *idem*. The Russians claimed to have taken 170,000 prisoners in a single fortnight. The Austrian centre in the Tarnopol region continued to hold out. German reserves now began to arrive at Kowel on the German extreme left, and counter-attacked vigorously. The offensive on the extreme Russian right near Kowel was checked at the end of the month. It was only towards the middle of July that the Austrian Centre gave way and began to retreat. During this time, the defences of Lemberg were organized ; the Russians failed to capture this place. The Austrians now took up positions on the Gnita Lipa, the Narajowka and the Zlota Lipa.

During July, the Russians launched a series of offensives, as diversions, in the Northern Sector, in the Riga and Baranowitchi regions ; this seems to indicate that their operations in Galicia had commenced to flag. In August, however, the Russian offensive spirit revived and considerable progress was made by them in this region. Their Armies reappeared in the Carpathians, in the Bukovina, at Jacobeni, Kimpolung, and Kirlibaba, but they were still unable to gain the plains in the South. In the West the Russians captured Kolomea, Nadinorna, and Stanislau. Their enterprise against Halicz failed definitely in September.

After three months fighting, Broussiloff's great offensive came to a standstill without having obtained a decisive result, although it was by no means entirely abortive. To it was due the fact that the Austrian offensive in the Trentino was checked ; the Franco-British push in the Somme was also materially assisted by reason of the occupation found for German troops in the Eastern theatre.

Since that time, the Russians have not done very much. When the Roumanians came into the War as belligerents, it was quite expected that Russo-Roumanian Armies would over-run Hungary. But, for some reason still unexplained, things have gone awry and the only help Russia has been able to give her southern neighbour has consisted in the assistance which enabled the broken remnants of the Roumanian Army to make good their retreat towards the frontiers of Bessarabia.

Since the Revolution in March last, the Russians have only once assumed the offensive, namely on the 1st July.

## NOTES AND NEWS.

*Switzerland.*—A special correspondent states that Ex-Councillor Hoffmann had the reputation of being a friend of General Wille, but otherwise he had no other friends in the Swiss Army, which in no way regrets his departure from the Ministry. He was elected to the Federal Council on a retrenchment ticket and he cut down the military budget in order to satisfy those who had raised him to high office. Hoffmann

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is held responsible for the deficiencies of all kinds in the Swiss Army brought to light in 1914.

Hoffmann's unpopularity in the Army was increased by reason of his attitude in connection with the dropping of bombs on Porrentruy by German aviators. He unjustly allowed an unfavourable impression to be created concerning the acts of Swiss officers who had simply done their duty on this occasion.

M. Ador, who succeeds Hoffmann, appears also to be an *Economist*. His last act, before elevation to office, consisted in an invitation to the Federal Council to deal with the question of a reduction of the military budget, and more particularly in relation to the vote for fortifications. His wisdom on military subjects is much questioned.

The Chaux-de-Fonds incident is closed. The six battalions which had been quartered in this town have been provided with accommodation elsewhere.

*United States of America.*—A special correspondent contributes some notes on "*The Emergency Army Bill*," signed by President Wilson on the 18th May last, establishing the principle of compulsory service in the United States. The delay (of 50 days from the date of the declaration of the war) in getting this Bill through Congress was not entirely due to the obstructive tactics of the pacifists. Many subsidiary matters, such as the sale of intoxicants, the formation of a division under ex-President Roosevelt, &c., gave rise to a large number of resolutions, involving amendments which came in for a good deal of discussion.

The main features of the Bill are as follows :—

1. *Composition of the Army.*—The regular army is put on a war footing. The National Guards of the various States may, at the discretion of the President, be incorporated into the National Army. Half a million of men—between 21 and 30 years of age—are to be raised at once as a first levy by the drawing of lots. The President is also authorized to raise a second levy of half a million.

2. *Volunteer Divisions.*—Four Divisions (infantry) are to be specially raised wholly by voluntary enlistments—minimum age of recruits for these divisions, 25 years.

3. *Recruiting.*—No bounties are to be paid to recruits, whether volunteers or conscripts, and no substitution is to be permitted. Voluntary enlistment is to be open to males over 18 and under 41 years of age.

4. *Exemptions.*—The following are wholly exempted from military service :—Vice-President of the Republic, members of Cabinet, members of Congress and local Assemblies, clergy of all persuasions, and theological students. Those whose religious tenets forbid the shedding of blood are to serve in the departments of the Army. The President may exempt municipal officials, munition workers, sailors, heads of households, etc.

5. *Officers.*—In the event of a deficiency of officers on the active and reserve lists temporary commissions may be granted subject to confirmation by the War Minister.

6. *Measures Relating to Enforcement of Conscription.*—Every male within the prescribed ages must register by the given date ; penalty for failure one year's imprisonment. Foreigners must comply with this

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law. Local Commissions decide who shall serve and who shall be exempt. An Appeal Tribunal is set up.

7. *Standing Provisions.*—In addition to M.G. Companies forming part of the several Corps, the President may raise three extra M.G. Companies per infantry and cavalry brigade and four divisional companies per infantry and cavalry division. The President has power to appoint officers of all grades up to and including those of Colonel's rank; promotion to General's rank remains in the hands of the Senate.

8. *Increase of Pay.*—The pay of all grades receiving less than 21 dollars per mensem is increased by 15 dollars; rates of pay above 21 dollars and below 45 dollars are increased according to a decreasing scale. The pay of a private is doubled; *i.e.*, it is raised to £6 6s. per mensem.

The 5th June was fixed upon as the last date by which all must register. Seven million names approximately have been entered on the registers. The first levy was not to be called up before September. Nine regiments of engineers were raised at once; they consist entirely of volunteers and were to be sent to France as early as possible for railway work, etc.

The National Guard is still much below establishment; on a War footing it amounts to 402,965 men, distributed as follows:—Infantry, 144 regiments; Cavalry, 16 regiments; Field Artillery, 48 regiments; Engineers, 16 regiments; Signallers, 16 battalions; Flying Corps, 15 squadrons; Coast Artillery, 212 companies; "Coast artillery supports," 1 battalion.

The old regular army on a war footing consists of:—4 Infantry Divisions (Continental organization), 2 Cavalry Divisions, 1 Division in the Philippines, Panama zone troops.

The Conscript Army is to comprise the following:—16 Infantry Divisions, each of 913 officers, 27,443 O.R.; 16 Divisional Hospitals, each of 24 officers, 222 O.R.; 64 Field Dressing Stations, each of — officers, 2 O.R.; 2 Cavalry Divisions, each of 607 officers, 16,021 O.R.; 2 Cavalry Divisional Hospitals, each of 24 officers, 238 O.R.; 6 Cavalry Field Dressing Stations, each of — officers, 2 O.R.; Medical Services, 288 officers. 1,000 O.R.; Coast Artillery, 666 officers, 20,000 O.R.

*Army Troops.*—16 Brigades of Heavy Artillery, each of 48 officers, 1,319 O.R.; 8 Squadrons Flying Corps, each of 10 officers, 154 O.R.; 8 Balloon Companies, each of 19 officers, 154 O.R.; 10 Field Hospitals, each of 6 officers, 73 O.R.; 10 Field Ambulances, each of 5 officers, 150 O.R.; 22 Bakery Companies, each of 1 officer, 67 O.R.; 6 Telephone Battalions, each of 10 officers, 215 O.R.; 16 Pack Transport Companies, each of — officers, 14 O.R.; 6 Ammunition Trains, each of 4 officers, 852 O.R.; 6 Supply Columns, each of 2 officers, 426 O.R.

The establishments of above formations, etc., total 18,538 officers and 528,659 men.

The officers for the above formations are to be drawn from the Regular Army, the National Guard and the Reserve of Officers; a certain number of men from selected professions are also to be appointed to commissions. The higher commanders, one Major per regiment and the regimental staff must all be drawn from the Regulars.

At the time that the original notes were written some 40,000 applicants for Commissions in the Reserve of Officers were in training in 16

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camps formed for the purpose. The incapables had been got rid of, and the remainder were (from the 15th June last) to be appointed to the various arms in order to undergo special training for a couple of months; finally, after taking part in a week's manœuvres, those qualified were to be commissioned, in order to proceed at once with the training of the Conscripts. All necessary arrangements had been made for the embodiment and training of the first levy of half a million men. The information given above is contained in a communication issued to the American Press by the United States War Minister.

## Information.

### *Switzerland.*

*The Hoffmann-Grimm Affair.*—It is said that the Swiss have not come out of the Hoffmann-Grimm affair quite so badly as was at first expected would be the case. It is felt that the causes which were responsible for this affair still exist and that Switzerland is not yet at the end of her adventures. Regret is expressed that the oldest of democracies has been the least apt of all nations to understand the true political and social significance of the present War. It is pointed out that the conflict existing in Switzerland between the Civil and Military Powers has given rise, in the Chamber of Deputies, to a desire to revise the two Articles of the Constitution dealing with the functions of the Federal Assembly and those of the Supreme Command of the Army. The text of these articles is given; they are drawn up in wide terms. It is now proposed to define more precisely the respective limits of authority of the Civil Power and the Military Power. The writer of the *Revue* article is of opinion that nothing is to be gained by detailed definitions. He rightly considers that the application of the provision of a Statute is a matter controlled by the personality of those administering the law and not by the terminology of the Statute. It is suggested that had there been fewer politicians and a larger number of statesmen in the Federal Council possibly the Staff of the Swiss Army would have been selected on principles different to those actually adopted. Whether the Federal Council has been acting under Hoffmann's inspiration or under a common inspiration, the fact remains that matters have drifted into an extremely unsatisfactory condition. The relations between the military department and the Higher Command of the Swiss Army are not, it is suggested, what they should be; for three years past a *régime* has existed in which compromises between ill-chosen officials, who have been at times even antagonistic to one another, have been the order of the day. It is pointed out that what is wanted is the adoption of measures which will place the pilotage of the bark of State in competent hands. Were this to be done the law would then be found to work perfectly.

The situation discussed is one which has been causing an immense amount of irritation in Switzerland.

*The Military Press.*—The announcement is made that Colonel Feldmann recently succeeded Colonel Hungerbuhler as Editor of the *Monatschrift für Offiziere Aller Waffen;* and further that on General Wille's invitation Colonel Wildbolz has taken over the Editorship of the *Allgemeine Schweizerische Militärzeitung.*

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*France.*

*Field Warfare.*—A French officer writing under the date 15th March, 1917, says that with the return of Spring the question was in every one's mouth: "Shall we see the *guerre de mouvement* once more?" He replies that three conditions are necessary for this to be possible:—(1) A breach must be made in the enemy's defensive system to its full depth; (2) the various sections of the enemy's fortifications must be completely disintegrated; and (3) the enemy troops detailed for the defence of positions must also be completely broken.

It is considered that, with the enormous expenditure of ammunition now taking place, the enemy's fortifications must eventually be disintegrated. However, it is doubtful whether the troops holding positions can ever be sufficiently broken to make warfare in the open to be again possible. Broussiloff in 1916, broke the German front in two places and penetrated far into the enemy's positions, but the German soldiers, in spite of the heavy casualties suffered, sealed the breaches and reformed their line. It has been argued that a break down in ammunition supply and the bad conditions of the roads were responsible for the failure on the part of the Russians to complete their success. It is evident that the writer of the *Revue* article does not consider the prospects of an early return to open warfare on the French front very bright.

This number of the *Revue* concludes with Notices relating to works of military interest published recently.

W. A. J. O'MEARA.

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*RIVISTA DI ARTIGLIERIA E GENIO.*

*June*, 1917.

RESUMPTION OF ITALIAN MILITARY OPERATIONS (*continued*).

*The Austrian Counter-Offensive.*

There is no doubt that the enemy foreseeing the Italian offensive and with the intention of attempting one himself, had taken advantage of the situation created on the Russian front, and had ordered a concentration of troops behind his own lines and east of the Isonzo. From the presence of new artillery the Italians had tangible proof of this during their offensive. Owing to delay and the limited number of reinforcements the enemy's advance was assisted while he thought, by counter-attacks and by his knowledge of the ground and the certainty that the Italian defences had not been able to gain the necessary efficiency, to deprive them for the second time of the advantages that they had secured.

The heavy attempts that the enemy intended to make on the Carso were preceded by demonstrative actions conducted with great intensity; such as that of the 1st June, while a violent destructive fire was delivered on Faiti, and infantry attacks on the Quota 174 of Tivoli, 126 of Grasigno and 652 of Vodice. On the 2nd the bombardment of Faiti increased in violence, and on the 3rd extended along the whole front from Monte San Marco to Flondar. The Italian artillery replied with success to the

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enemy's fire and arrested the advance of the infantry. On the 4th the action was further developed from San Marco to the sea and contineud uninterruptedly for three days. Three days of intense action were sustained by the Italian troops under difficult conditions on positions recently captured, and not sufficiently organized for defence. The enemy's attack at first had some temporary results on the left of the Italians ; it was violently repulsed in the centre and was slowly arrested on the right.

On the night of the 4th there were violent attacks on the Italian positions on the northern slopes of M. San Marco on which the enemy succeeded in placing foot. A strong counter-attack at once dislodged him. The positions between Versic and Jamiano bear witness to an epic strife without precedent, and to bravery worthy of great praise. The troops of the 61st Division, the magnificent Brigade of the Granatieri di Sardigna (Sardinian Grenadiers), 1st and 2nd Regiments Siena (3 1st and 32nd Regiments), and Bari (139th and 140th Regiments) with frequent hand-to-hand combats, and with obstinate defence succeeded in overwhelming the enemy who decimated was compelled to desist from the attack.

On the right, and to the south of Jamiano the Italian position was not advantageous, and the short time that elapsed between their offensive and the enemy's action had not been sufficient to modify the conditions to their advantage. It then became necessary to retire somewhat further to avoid the destructive effects of the enemy's artillery. A further batch of 585 prisoners including 30 officers remained in the hands of the Italians during the course of these defensive combats.

*Co-operation of the Various Arms.*

The positive results of this offensive in the spring was, as has been said, very important owing to the tactical objectives gained, not less than for the losses inflicted on the enemy. In addition to 24,000 prisoners, including 634 officers, it is calculated that about 100,000 men were put out of action. The fraternal co-operation of the artillery, siege, field, and mountain, was most efficacious. Ten batteries of English artillery of medium calibre, and coast batteries which were also employed were most valuable.

The bombarding batteries, and the mitrailleuse companies distinguished themselves both by the valour of the men, and by the accuracy of their fire, destroying the enemy's wire defences and trenches, the second accompanying the rifles in the assault, and strongly defending the assailed position. Although it was not possible to use the cavalry in its own tactical manner, the officers and men of this arm rendered valuable service with the batteries, and mitrailleuses, and their losses were considerable. The aviators performed many acts of valour both in reconnoitring and in the offensive. All the different branches of the engineers distinguished themselves, renewing both old and new records, in working with cool courage under the enemy's fire. Sappers, telegraphists, pontooneers, miners, railway-men, air-men, telephonists rivalled one another in bravery. All the auxiliary services, sanitary, Red Cross, S.O.M. of Malta, commissariat, automobilists, worked in an excellent manner.

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*On the Asiago Heights.—Minor Operations.*

The enemy had no time to recover from the formidable shock which he had undergone on the Isonzo, before the energies of the Italians compelled him to hasten to the defences on the heights of Asiago. Intense bombardments and arduous infantry attacks pursued him there, compelling him, notwithstanding the advantages of a defensive position which everywhere dominated that of the Italians, to re-arrange his troops continually on the various threatened points, and inflicting on the whole front a series of blows which according to trustworthy information had wasted his forces and his capacity for resistance. A great mine was exploded by the enemy on the night of the 28th May on the Piccolo Lagazuoi (Rio Castrana) which caused an enormous crater, but this did not affect the resistance of the Italians and the losses to their defences were at once repaired. On the 28th June the Italians exploded a powerful mine near the enemy's positions on Peak 2668 on the southern margin of Piccolo Lagazuoi, entirely destroying the guard, and succeeded in occupying and holding the peak. During the second half of May, and in the beginning of June detachments of Alpine troops, by arduous scaling, succeeded in occupying several dominating points at the head of the Zebra valley and on the 15th June with the aid of the skien stormed the Corno di Caven to the chief of the Austrian defences on the valley of Famo.

*Aerial Actions.*

Several brilliant air combats were conducted by the brave Italian air-men during this period of the offensive operations. Thirty-five enemy aeroplanes were brought down in aerial duels or beaten down by fire from anti-aircraft batteries and large quantities of high explosives were dropped on the enemy's railway lines. In the valley Tippacco dense masses of the enemy's troops and convoys of artillery were bombarded by Italian airships with effective results.

On the 23rd May on the enemy's heights of Medezzar and Flondar, and on the 19th, during the action on the zone of Monte Ortigara, several aerial battles took place, quantities of explosives being dropped on the enemy's troops.

*In Albania and Macedonia.*

In Albania on the southern front there were no military events of importance except some encounters between the Italian-Albanese bands and the Austrian soldiers in the region of Alto Osum. During the first 15 days of June, in order to succour the misery of the population of Ciamurià, and the regions of Zagori and Pindo who were suffering from the vigours of the blockade, and to put an end to the brigandage which was a threat to them, the Italians extended their occupation of the localities of Murco, Parga, Margariti, Janina, Zagori, and Pindo. At the same time some very important civil work was undertaken on the road Santi Ouaranta-Florina which was most useful for military purposes. On the Macedonian front, in the month of May the Italian troops co-operated successfully in the general offensive of the armies of the Allies. So, at the commencement of the third year of War, the Italian Army, fighting and conquering always gave signs of increasing power, and continual perfection of organization, corresponding with incessant renovation of all the physical and moral energy of a Nation in arms.

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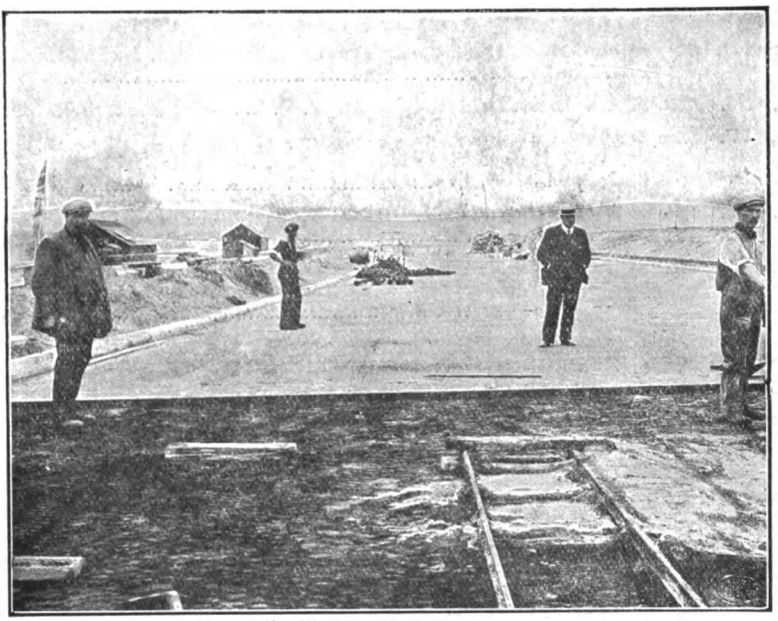

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